

NIST Calibration Program Calibration Services Users Guide SP 250 Appendix Fee Schedule 2005

Calibration Services:

Dimensional

Mechanical

Thermodynamic

Optical Radiation

Ionizing Radiation

Electromagnetic

Time and Frequency

NIST

National Institute of
Standards and Technology
Technology Administration
U.S. Department of Commerce

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CHAPTER 1

POLICIES

A. Introduction

The calibration services of the National Institute of Standards and Technology (NIST) are designed to help the makers and users of precision instruments achieve the highest possible levels of measurement quality and productivity. The services listed in this Fee Schedule constitute the highest order of calibration services available in the United States. They directly link a customer's precision equipment or transfer standards to national and international measurement standards. These services are offered to public and private organizations and individuals alike.

For more specific information, the NIST Calibration Services Users Guide, SP 250, contains data on uncertainty and other technical references. Copies are available upon request or consult our web site (see Section L).

B. Types of Calibration Services

- Calibration Services
- Special Tests
- Measurement Assurance Programs (MAPs)

NIST provides Calibration Services using well-characterized, stable and predictable measurement processes. NIST calibrates instruments and devices that are metrologically suitable as reference or transfer standards.

Special Tests are either unique or seldom-performed calibrations or measurements requested by the customer.

Measurement Assurance Programs are quality control programs for calibrating a customer's entire measurement system. In a typical MAP, a stable artifact or set of artifacts called transfer standards are first measured by NIST and then sent to a customer's laboratory for a series of measurements. The transfer standards are then returned to NIST for remeasurement, along with the participating laboratory's results. NIST reports its comparative findings to the customer and, when necessary, offers guidance on achieving and maintaining measurement quality. Successful use of a NIST MAP requires that the customer make periodic measurements of in-house check standards to estimate their measurement process uncertainty and to ensure that the measurement process remains in a state of statistical control. Unless a laboratory has a measurement quality assurance program to monitor its own measurement process parameters continuously, there is no value in participating in a MAP. In fact, NIST recommends that its customers establish and use a measurement quality assurance program to monitor their measurement parameters, whether or not they participate in a MAP.

C. Other NIST Measurement Transfer Services

National Voluntary Laboratory Accreditation Program (NVLAP)

NIST does not audit or regulate metrology laboratories as part of MAP or other calibration services. Calibration laboratories and testing facilities may be accredited by NIST under the National Voluntary Accreditation Program (NVLAP). The basic procedures and general accreditation requirements of NVLAP are described in NIST Handbook 150. A participating laboratory may voluntarily take steps to improve or assess its measurement process. For further information about NVLAP, contact:

National Voluntary Laboratory Accreditation Program (NVLAP)
National Institute of Standards and Technology
100 Bureau Drive, Stop 2140
Gaithersburg, MD 20899-2140

Telephone: (301) 975-4016
Fax: (301) 926-2884
Email: NVLAP@nist.gov
Internet: www.ts.nist.gov/nvlap

Standard Reference Materials Group (SRM)

Calibration assistance and alternative paths for traceability are provided by NIST's Standard Reference Materials Group. Chemical measurement instruments are not calibrated at NIST, but NIST provides suites of Standard Reference Materials (SRMs) for the calibration of the instrument by the user. In addition, NIST provides SRMs for dimensional measurements, thermodynamic property and photometric measurements. For further information about SRMs, contact:

Standard Reference Materials Group (SRM)
National Institute of Standards and Technology
100 Bureau Drive, Stop 2322
Gaithersburg, MD 20899-2322

Telephone: (301) 975-6776
Fax: (301) 948-3730
Email: srminfo@nist.gov
Internet: www.nist.gov/srm

Standard Reference Data Group (SRD)

Very few calibrations can be conducted without additional quantitative information related to measurement of physical or chemical properties. NIST develops and publishes evaluated data for technical and scientific applications called Standard Reference Data. For further information about SRD, contact:

Standard Reference Data Group (SRD)
National Institute of Standards and Technology
100 Bureau Drive, Stop 2310
Gaithersburg, MD 20899-2310

Telephone: (301) 975-2208
Fax: (301) 926-0416
Internet: www.nist.gov/srd

Weights and Measures Division (W&M)

The NIST Weights and Measures Division (W&M) provides measurement services to State and local governments responsible for marketplace transactions involving measurements. State weights and measures laboratories provide alternative sources for calibration services in mass, length, volume, and certain other measurement areas. For further information contact:

Weights and Measures Division (W&M)
National Institute of Standards and Technology
100 Bureau Drive, Stop 2600
Gaithersburg, MD 20899-2600

Telephone: (301) 975-4004
Fax: (301) 926-0647
Email: owm@nist.gov
Internet: www.nist.gov/owm

D. Criteria for Quality Assurance

All the measurement services listed in this document meet rigorous criteria for quality assurance. Calibration Services and MAPs satisfy the most demanding and explicit requirements in that they are carried out regularly under pre-established and well-defined conditions; the measurement processes involved are well-characterized, stable, and statistically controlled; and quality-control procedures are well-defined and strictly followed. Furthermore, each Calibration Service or MAP is planned and documented to permit continuity of service over time.

A Special Test is so designated for one or more of the following reasons: (1) the specific type of calibration is seldom requested, thus precluding the maintenance of a large statistical base for characterizing the measurement process; (2) the test request is unique; or (3) the service is still under development—meaning the measurement or calibration methods are still being perfected, or all quality-control documentation not been completed.

E. Fees

NIST recovers the cost of providing calibration services by charging a fee for each calibration performed. The costs of services are published in the Fee Schedule, which is updated and published annually to reflect changes in prices and services. Even so, the cost of many services varies according to your exact calibration specifications; you must therefore provide the technical contact with an exact description of work before receiving a price quote.

NOTE: Fees for NIST services do not include shipping costs or insurance.

F. Reports of Calibration/Test Results

Reports on calibrations or other services are the property of the customer. Copies are supplied to other parties only as required by federal law or requested in writing by the customer. The results of calibrations and tests performed by NIST apply only to the specific instrument or standard at the time of test unless otherwise clearly stated.

G. Traceability

The International Vocabulary of Basic and General Terms in Metrology (VIM; 1993) defines traceability as:

The property of the result of measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties.

Many government regulations and commercial contracts require regulated organizations or contractors to verify that the measurements they are “traceable” and to support the claim of traceability by keeping records that their own measuring equipment has been calibrated by laboratories or testing facilities whose measurements are part of this “unbroken chain.” The purpose of requiring traceability is to ensure that measurements are accurate representations of the specific quantity subject to measurement, within the uncertainty of the measurement.

NIST reports its calibration results, with the measurement values accompanied by the uncertainties associated with the methods, operators, and environment at NIST. Users of these calibration services will make their own measurements with the calibrated instruments or artifacts. In addition to the uncertainty indicated by NIST, other uncertainties are inherent in the instrument, associated with the method or protocol in using the instrument, with the operator of the instrument, and with the physical environment (pressure, temperature, humidity, etc.) in which the measurements are made. Thus, the measurements made with the calibrated instruments or artifacts by organizations outside of NIST have total uncertainty budgets associated with them, only one component of which is the uncertainty reported to them by NIST.

NIST often receives calls to verify the authenticity of a NIST Report of Test number appearing on another organization’s report. Although NIST can verify the authenticity of its report numbers, having an authentic number does not provide complete assurance or evidence that the measurement value provided by another organization is traceable. Not only should there be an unbroken chain of comparisons, each provided measurement should be accompanied by a statement of uncertainty associated with farthest link in the chain from NIST, that is, the last facility providing the measurement value. NIST does not have that information; only the facilities that provided the measurement values to the customer can provide the associated uncertainties and describe the traceability chain.

In summary, to adequately establish an audit trail for traceability, a proper calibration result should include: the assigned value, a stated uncertainty, identification of the standards used in the calibration, and the specification of any environmental conditions of the calibration where correction factors should be applied, if the standard or equipment were to be used under different environmental conditions.

NIST does not define nor enforce traceability except in its NVLAP laboratory accreditation program. Moreover, NIST is not legally required to comply with traceability requirements of other federal agencies; nor do we determine what must be done to comply with another party's contract or regulation calling for such traceability. However, NIST can and does provide technical advice on making measurements consistent with national standards.

Although NIST supports making the user aware of traceability and provides the user with details as to how traceability is established, NIST does not allow the prominent display of its name on proprietary products or in the advertising of them. (See Section J).

H. NIST Policy on Reporting Measurement Uncertainty

To ensure that NIST uncertainty statements are consistent across the organization and with international practice, NIST policy requires that all NIST measurements be accompanied by statements of uncertainty as discussed in NIST Technical Note 1297¹. That publication is based on the approach to expressing uncertainty in measurements recommended by the International Committee on Weights and Measures (CIPM)². That committee established general rules for evaluating and expressing uncertainty in measurements that are intended to be applicable to a broad spectrum of measurements. Copies of NIST TN 1297 are available upon request (see Section L) or on the web site: www.physics.nist.gov/Pubs/guidelines/contents.html.

The American National Standard for Expressing Uncertainty-U.S. Guide to the Expression of Uncertainty of Measurement (ANSI/NCSL Z540-2-1997) is available from the

NCSL International
2995 Wilderness Place, Suite 107
Boulder, CO 80301-5404
303/440-3339
www.ncsli.org

NIST reports its calibration results with the measurement values accompanied by the uncertainties associated with the methods, operators, and environment at NIST. Users of these calibration services will make their own measurements with the calibrated instruments or artifacts. In addition to the uncertainty indicated by NIST, other uncertainties are inherent in the instrument, associated with the method or protocol in using the instrument, with the operator of the instrument, and with the physical environment (pressure, temperature, humidity, etc.) in which the measurements are made. Thus, the measurements made with the calibrated instruments or artifacts by organizations outside of NIST have total uncertainty budgets associated with them, only one component of which is the uncertainty reported to them by NIST.

I. NIST Policy Regarding Use of Metric (SI) Units

In accordance with the Metric Conversion Act of 1975 as amended by Section 5164 of the Omnibus Trade and Competitiveness Act of 1988 and as required by related provisions of the Code of Federal Regulations, the National Institute of Standards and Technology (NIST) uses the modern metric system of measurement units (International System of Units–SI) in all publications. When the field of application or the special needs of users of NIST publication require the use of non-SI units, the values of quantities are first stated in the SI units and the corresponding values expressed in non-SI units follow in parentheses. Copies of NIST SP 811³ are available upon request (see Section L) or on the web site: www.physics.nist.gov/Pubs/SP811/sp811.html

¹Guideline for Evaluating and Expressing the Uncertainty of NIST Measurement Results, NIST Technical Note 1297, 1994 Edition.

²Guide to the Expression of Uncertainty in Measurement, International Standards Organization (ISO), 1993 Edition.

³Guide for the Use of the International System of Units (SI), NIST Special Publication 811, 1995 Edition.

J. Reference to NIST in Advertisements

The NIST measurement/test results or reports shall not be used to indicate or imply that NIST approves, recommends, or endorses the manufacturer, supplier, or user of any instruments or standards or that NIST in any way guarantees or predicts the future performance of items after calibration or test. No reference shall be made to NIST or to reports or results furnished by NIST in any advertising or sales promotions, which would indicate or imply that NIST approves, recommends, or endorses any proprietary product or proprietary material.

K. Disclaimer

Commercial products, materials, and instruments, are identified in our communications and documents for the sole purpose of adequately describing experimental or test procedures. In no event does such identification imply recommendation or endorsement by NIST of a particular product; nor does it imply that a named material or instrument is necessarily the best available for the purpose it serves.

L. Questions and Inquires

This Fee Schedule is intended to make the task of selecting and ordering an appropriate calibration service as quick and easy as possible. Nevertheless, when questions arise, you should contact NIST for immediate clarification.

General inquires about the NIST calibration services, assistance in determining the availability of services, and requests for complimentary copies of the Calibration Services Users Guide, the Fee Schedule, Guide for the International System of Units (SP 811), and Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results (TN 1297) are to be addressed to:

Calibration Program
National Institute of Standards and Technology
100 Bureau Drive, Stop 2330
Gaithersburg, MD 20899-2330
Telephone: (301) 975-2092
Fax: (301) 869-3548
Email: calibrations@nist.gov
Internet: www.ts.nist.gov/calibrations

For technical questions concerning a specific service, directly contact the NIST staff member responsible for that calibration area.

CHAPTER 2

ORDERING INSTRUCTIONS FOR DOMESTIC CUSTOMERS

A. Customer Inquires

General customer inquires for information or clarifications about the NIST calibration services may be directed as indicated in Section L of Chapter 1.

B. Prearrangements and Scheduling

Services should be arranged in advance, beginning with direct contact with a NIST technical staff member responsible for the desired service. Use the appropriate technical section of the Users Guide or Fee Schedule to determine whom to contact. This advance communication may answer your questions, clarify the policies and procedures briefly described here, and will permit you to schedule a tentative calibration date. Following the initial communication, you must complete and submit a purchase order and prepare to ship the item according to the procedures described below or agreed upon with the technical contact. If a calibration is scheduled far in advance, the item should not be shipped until shortly before the scheduled date; you must submit the purchase order (complete with the name and number of the desired service) before a firm calibration date can be assigned. When NIST receives your purchase order and assigns a firm service date, your order will be confirmed by the technical contact.

C. Purchase Orders

Before you ship an item for calibration, send a purchase order to the address listed in the appropriate technical section of the Users Guide or Fee Schedule. The purchase order must:

1. State both the name and number of the NIST service (listed in this Fee Schedule as the “Service ID Number”) being requested. **FAILURE TO INCLUDE THE SERVICE ORDER NUMBER WILL SERIOUSLY IMPEDE SCHEDULING AND SERVICE.**
2. Clearly identify the item(s) being send for calibration, including any serial number(s) or model number(s).
3. Give the name, address, and telephone number of your company’s procurement officer, purchasing agent or other administrative/financial authority.
4. Give the name, address, and telephone number of your company’s technical contact, if different from above.
5. List separately the instructions and address for return shipment, insurance, mailing address for the calibration/test report, and billing address. (Federal or state agency requests for calibration services should be accompanied by a document authorizing that the cost of the service be billed to the agency.)
6. Clearly state any special or necessary conditions of test, such as operating frequency or temperature.
7. Clearly state the customer identification number; i.e., social security number (EIN) for individuals; tax identification number (TIN) for organizations; or agency location code (ALC) for government customers.
8. If the calibration or test report is to be handled in a special manner, give instructions on the purchase order.

NOTE: Receipt of orders by NIST does not imply acceptance of any provisions set forth in the order that are contrary to the policy, practice, or regulations of NIST or the U.S. Government. In general, NIST will not sign any affidavits, acknowledgement forms, or other documents that may be required by company policy governing the procurement of goods and services.

D. Shipping, Insurance, and Risk of Loss

Ship the instrument or standard to the mailing address of the technical group providing the service. Please take note that the mailing address is not the same for every technical group.

Please adhere rigorously to the following procedures:

1. Ship only items in good repair. Apparatus in disrepair will not be calibrated. If defects are found after calibration has begun, the procedure will be terminated, a report issued, and a charge levied for work completed.
2. Use strong, reusable packing materials and containers marked clearly and indelibly on the outside with the requestor's name, address and the following notation: **REUSABLE CONTAINER, DO NOT DESTROY.**
3. Follow any special shipping procedures given in the technical sections of the Calibration Services Users Guide, particularly those sections covering radiation and dosimetry measurements.
4. Insure the shipments to and from NIST and clearly state the method of return shipment. NIST will not assume liability for loss or damage unless such loss and damage result solely from the negligence of NIST personnel. If return shipment by parcel post is requested or is suitable, NIST will prepay the return shipment but will not insure it. When no shipping or insurance instructions are furnished, NIST will return the shipment by common carrier, collect and uninsured.
5. Shipments to NIST must be at FOB destinations (customer pays for shipping.)
6. Return shipments are sent FOB origin (customer pays for shipping.)

NOTE: Fees for NIST services do not include shipping cost or insurance.

E. Turnaround Time

Normal turnaround time for NIST calibration services varies greatly—usually from several weeks to several months depending on the type of service requested, and the service schedule. Some services are only scheduled once or twice a year with appointments made months in advance of the service date. To avoid unnecessary scheduling or administrative delays in the calibration process, always make arrangements with the technical contact for the service you wish to utilize prior to shipping your instrument or artifact to us.

F. Customer Checklist

Please refer to page 11 in this chapter for a Customer Checklist which is intended to assist you in developing the basic information required to process an order for calibration services at NIST.

Customer Checklist for Ordering NIST Calibration Services

Information Obtained from NIST Technical Contact	Comments
NIST Contact (name/telephone)	Provide this information on your purchase order (po)
Is the service available?	Please make sure customer's technical contact discusses service with NIST technical contact before proceeding.
NIST Service Identification Number	Provide this information on your po
Estimated cost of services	Provide this information on your po
Estimated turnaround time	Many calibration services are batched. Find out when to send the instrument.
Special instructions	
Packaging instructions	
Shipping instructions	
Other Precautions	
Information Supplies by the Customer on Purchase Order	
Purchase order number	
Purchase order date	
Customer's tax identification number	
Customer's mailing address	
Customer's billing address	
Name, telephone number, fax number, email address of administrative or procurement contact point at customer's location	
Name, telephone number, fax number, email address of technical contact point at customer's location	
Ship-to address (including NIST technical contact name)	
Return address (for shipment back to customer)	
NIST Service Identification Number	
Estimated cost	
Shipping terms (no FOB destination on return shipment)	
Special instructions from customer's technical contact	

CHAPTER 3

SPECIAL INSTRUCTIONS FOR FOREIGN CUSTOMERS

A. Foreign Inquires

Foreign customers should address all inquiries to:

Calibration Program
National Institute of Standards and Technology
100 Bureau Drive, Stop 2330
Gaithersburg, MD 20899-2330
United States of America
Telephone: (301) 975-2092
Fax: (301) 869-3548
Email: calibrations@nist.gov
Internet: www.ts.nist.gov/calibrations

NOTE: Please clearly indicate your **city** and **country** on all correspondence so that we may promptly respond to your request.

B. Criteria for Providing Service

Under certain circumstances, NIST is authorized to provide measurement service, including calibration services, for organizations or individuals located outside the United States. However, the Calibration Program must review each request for calibration services to determine if services are available to the requestor's organization in the requestor's country. Foreign customers must provide the following information, in writing, to the Calibration Program (see address above):

1. Identification of the item(s) to be calibrated, including serial and model numbers.
2. A detailed description of the measurements that are needed, or indicate the service identification number.
3. A description of any special requirement/circumstance that might affect the decision to provide the service. For example, will adjustments have to be made to the instrument, or will the time period be restricted in which the device is available for calibration?
4. A complete name and address of the requestor's organization.

C. Special Instructions

If the request for calibration service is accepted by NIST, the requesting organization will be notified of the cost of service and will be given the contact information for the NIST technical unit that will perform the measurements. The requesting organization must then complete the following steps:

1. Contact the NIST technical staff that will perform the service to determine the time schedule.
2. Send a purchase order to the Calibration Program. Provide complete addresses, including country, for returning the instrument and for mailing the calibration or test report.
3. NIST policy requires prepayment for all NIST calibration services requested by non-U.S. organizations. Before proceeding with any service(s) we will need a check, money order or a bank wire transfer. The prepayment must be for the full amount and be drawn on a U.S. bank. The prepayment methods are as follows:

Money Orders & Prepayment Check

Checks made payable to the National Institute of Standards and Technology (NIST) should be mailed to:

Calibration Program
National Institute of Standards and Technology
100 Bureau Drive, Stop 2330
Gaithersburg, MD 20899-2330

Bank Wire Transfers

Treas NYC (Account is with the Federal Reserve Bank of New York)
U.S. Dept. of Treasury
FMS-Banking Operations Branch
3700 East West Highway, Room 5A05
Hyattsville, MD 20782
Phone: 001 (202) 874-6617

ABA# 021030004
Account # 13060001
Account Name: TREAS NYC/CTR/BNF=/NIST/AC-13060001

Reference "Calibrations" to enable us to identify your payment. In addition, please be sure to pay any fees assessed for your bank wire transfers; otherwise, they will deduct it from your prepayment wire.

PLEASE NOTE: Our account number and name are of critical importance and must be referenced in order for NIST to be properly credited with your payment. It must appear in the precise manner shown to allow for the automated processing and classification of the funds transfer message. In addition, please refer to the NIST invoice number, your purchase order number, your country, and any other pertinent information that would help us identify your payment.

This transfer of funds can only be accomplished by your company going through a U.S. correspondent bank or by having your country's central bank send a swift telecommunication system message to the Federal Reserve Bank. Be sure to cover any processing fees your bank may charge you. Questions on bank wiring can be directed to the NIST Accounts Receivable Office at (301) 975-3880, email: billing@nist.gov, or fax at (301) 975-8943..

4. Before shipping the instrument or standard to the appropriate NIST technical unit, you must arrange with a customs broker for entry of the instrument into the U.S. with transportation to and from the port of entry to NIST prepaid. Air freight is most satisfactory. Entry bond is required for instruments not manufactured in the U.S. If arrangements are made with a broker in the country of origin, that broker should, in turn, have a U.S. customs broker in or near the port of entry to arrange for the entry of the instrument and its transportation to NIST. Direct arrangements can be made with customs brokers located in the Washington, DC/Baltimore, Maryland, metropolitan area or in the Denver, Colorado, area, as appropriate. These brokers must arrange for transportation to the port of exit after testing/calibration is completed.

D. Shipping Charges

The calibration costs quoted *do not* include shipping, insurance, or the services of a customs broker. You must arrange and pay for these services separately. For your information, NIST currently uses the following customs brokers:

Gaithersburg, Maryland

Laing International
P.O. Box 16144
Washington, DC 20041
Phone: (703) 471-9279
Fax: (703) 471-8436

Boulder, Colorado

FedEx Trade Networks
4725 Paris Street, Suite 200
Denver, CO 80239
Phone: (303) 371-9550
Fax: (303) 373-0850

You are not required to use these customs brokers, but may select a broker of your choice.

CHAPTER 4

DIMENSIONAL MEASUREMENTS

A. Length Measurements

A.1 Gage Blocks

<u>Technical Contacts:</u> Stacey Biggins Theodore Doiron	<u>Telephone:</u> (301) 975-3471 (301) 975-3472	<u>Email:</u> stacey.biggins@nist.gov theodore.doiron@nist.gov	<u>Mailing Address:</u> NIST 100 Bureau Drive, Stop 8211 Gaithersburg, MD 20899-8211
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Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

A.1 Gage Blocks		
Service ID Number	Description of Services	Fee (\$)
10010C	Gage Blocks: Set Up Charge, per order	151
10011C	Mechanical Comparisons, per Block (100 mm and shorter)	89
10012C	Mechanical Comparisons, per Block (over 100 mm)	207
10013C	Interferometry, per Block (100 mm and shorter), Maximum 25 Blocks per Order	246
10014C	Interferometry, per Block (over 100 mm), by Special Arrangement	At Cost
10015C	Non-standard size Gage Blocks, by Special Arrangement	At Cost

Fees are subject to change without notice.

A.2 Line Standards

<u>Technical Contact:</u> William B. Penzes Thomas W. LeBrun	<u>Telephone:</u> (301) 975-3477 (301) 975-4256	<u>Email:</u> wpenzes@nist.gov thomas.lebrun@nist.gov	<u>Mailing Address:</u> NIST 100 Bureau Drive, Stop 8212 Gaithersburg, MD 20899-8212
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Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

A.2 Line Standards		
Service ID Number	Description of Service	Fee (\$)
10020C	Line Standards: Scales, < 1 m (40 inches), 4 Passes	7079
10021C	Line Standards: Scales, < 1 m (40 inches), 8 Passes	10902
10022C	Line Standards: Stage Micrometer, Per Scale, 30 Intervals, 2 Passes	1185
10023C	Line Standards: Stage Micrometer, Per Scale, 30 Intervals, 4 Passes	1497
10024C	Line Standards: End Standards, < 1 m	7095
10025C	Line Standards: Grid Plates, Less than 60 Intervals, 1 D Linear Calibration	11879

Fees are subject to change without notice.

A.3 Metal Tapes/Scales and Long Length Artifacts

Technical Contacts:

Ronald G. Hartsock

Telephone:

(301) 975-3465

Email:

rhartsock@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8211
Gaithersburg, MD 20899-8211

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

A.3 Metal Tapes/Scales and Long Length Artifacts		
Service ID Number	Description of Services	Fee (\$)
10030C	Metal Tapes: Surveying, Oil Gaging and General Purpose; Metal Scales	At Cost
10040S	Special Tests of Surveying Leveling Rods and Long Length Artifacts	At Cost

A.4 Other Length Standards

Technical Contacts:

Eric S. Stanfield

Theodore Doiron

Telephone:

(301) 975-4882

(301) 975-3472

Email:

eric.stanfield@nist.gov

theodore.doiron@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8211
Gaithersburg, MD 20899-8211

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

A.4 Other Length Standards		
Service ID Number	Description of Services	Fee (\$)
10050S	Special Tests of Length Standards	At Cost

A.5 Sieves

Technical Contacts:

Stacey Biggins

Theodore Doiron

Telephone:

(301) 975-3471

(301) 975-3472

Email:

stacey.biggins@nist.gov

theodore.doiron@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8211
Gaithersburg, MD 20899-8211

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

A.5 Sieves		
Service ID Number	Description of Services	Fee (\$)
10060S	Special Test of Sieves	170

Fees are subject to change without notice.

A.6 Algorithms Testing and Evaluation Program for Coordinate Measuring Systems

Technical Contact:

Craig M. Shakarji

Telephone:

(301) 975-3545

Email:

shakarji@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8260

Gaithersburg, MD 20899-8260

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

A.6 Algorithms Testing and Evaluation Program for Coordinate Measuring Systems		
Service ID Number	Description of Services	Fee (\$)
10070S	Special Test of CMS Software: NIST-generated data sets (basic service)	1614
10071S	Special Test of CMS Software: NIST-generated data sets (per geometry evaluated)	At Cost
10072S	Special Test of CMS Software: NIST-generated data sets, standard level (per geometry evaluated)	822
10080S	Special Test of CMS Software: Customer-generated data sets (basic service)	2134
10081S	Special Test of CMS Software: Customer-generated data sets (per geometry evaluated)	At Cost
10082S	Special Test of CMS Software: Customer-generated data sets, standard level (per geometry evaluated)	881

Fees are subject to change without notice.

B. Diameter Measurements

Technical Contacts:

Eric S. Stanfield

(11010S-11060S)

Stacey Biggins

(11020C-11021C)

Theodore Doiron

Telephone:

(301) 975-4882

(301) 975-3471

(301) 975-3472

Email:

eric.stanfield@nist.gov

stacey.biggins@nist.gov

theodore.doiron@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8211

Gaithersburg, MD 20899-8211

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
11010S	Special Tests of Cylindrical Diameter Standards (i.e. Plug and Pin Gages): Set Up Charge, per order	150
11011S	Mechanical comparison, per Gage (25 mm and smaller)	87
11012S	Interferometry, per Gage (50 mm and smaller)	199
11013S	Per Gage (over 50 mm)	At Cost
11014S	Roundness trace, per trace	160
11020C	Measuring Wires for Threads and Gears: Set Up Charge, per order	150
11021C	Single Wire, per wire	91

11030S	Special Tests of Spherical Diameter Standards; Balls: Set Up Charge, per order (applies to mechanical comparison and interferometry)	140
11031S	Mechanical Comparison (51 mm or smaller), Average Diameter, per ball, Expanded Uncertainty, $U \sim \pm 89$ nm to 115 nm	83
11032S	Mechanical Comparison (over 51 mm), Average Diameter, per ball	At Cost
11033S	Interferometry (25 mm or smaller) Average Diameter, per ball, Expanded Uncertainty, $U \sim \pm 30$ nm	425
11034S	Ball Out-of-Roundness: Least-Squares out-of-Roundness and Polar Plots, price per trace (Typically three orthogonal traces for spheres and five traces for CMM calibration spheres)	81/per trace
Special Tests of Internal Diameter Standards: Ring Gages		
11040S	Plain Ring Gages, per ring	688
11050S	Special Tests of Length and Diameter	At Cost
11060S	Special Tests of Step Gages	At Cost

Fees are subject to change without notice.

C. Complex Dimensional Standards

Technical Contacts:

Dennis Everett (12010C-12070S)
John Stoup (12060S)
Theodore Doiron

Telephone:

(301) 975-5272
(301) 975-3476
(301) 975-3472

Email:

dennis.everett@nist.gov
john.stoup@nist.gov
theodore.doiron@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8211
Gaithersburg, MD 20899-8211

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
API Threaded Plug and Ring Gages		
12010C	Spec 5, 1.005 inches to 7 5/8 inches	1460
12011C	Spec 5, 8 5/8 inches to 20 inches	2334
12012C	Buttress Casing, 4 1/2 inches to 9 5/8 inches	1755
12013C	Buttress Casing, 10 inches to 13 3/8 inches	2145
12014C	Buttress Casing, 16 inches to 20 inches	2300
12015C	Line Pipe, 1/8 inch to 6 inches (New)	1460
12016C	Line Pipe, 8 inches to 20 inches (New)	1934
12017C	Extreme Line Casing, 5 inches to 7 inches (New)	2465
12018C	Extreme Line Casing, 5 inches to 7 inches (Used)	926
12019C	Extreme Line Casing, 7 7/8 inches to 10 inches (New)	2877
12021C	Extreme Line Casing, 7 7/8 inches to 10 inches (Used)	1182
12022C	Spec 7 (Rotary), NC 23-NC 61 (New)	1931

12023C	Spec 7 (Rotary), NC 70 (New)	2108
12024C	Spec 7 (Rotary), 2 3/8 inches to 4 1/2 inches, Reg. (New)	1934
12025C	Spec 7 (Rotary), 5 1/2 inches to 8 5/8 inches, Reg. (New)	2104
12026C	Spec 7 (Rotary), Any Type (Used)	858
12027C	Spec 11B (Sucker Rods) P1, P2 Pin Go P7, P8 Pin Go B1, B2 Box Go (NEW)	1007/per set
12028C	Spec 11B (Sucker Rods) P1, P2 Pin Go P7, P8 Pin Go B1, B2 Box Go (USED)	508/per set
12029C	Spec 11B (Sucker Rods) P3, P4 Pin Cone B3, B4 Box Cone (NEW)	1201/per set
12031C	Spec 11B (Sucker Rods) P3, P4 Pin Cone B3, B4 Box Cone (USED)	465/per set
12032C	Spec 11B (Sucker Rods) P5, P6 Pin Cone B5, B6 Box Cone (NEW)	818/per set
12033C	Spec 11B (Sucker Rods) P5, P6 Pin B5, B6 Box Cone (USED)	425/per set
12050S	Special Test of Threaded Plug and Ring Gages	At Cost
12060S	Special Tests of Two-Dimensional Gages	At Cost
12070S	Special Complex Dimensional Test by Prearrangement	At Cost

Fees are subject to change without notice.

D. Optical Reference Planes and Roundness Standards

Technical Contacts:

Eric S. Stanfield
Theodore Doiron

Telephone:

(301) 975-4882
(301) 975-3472

Email:

eric.stanfield@nist.gov
theodore.doiron@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8211
Gaithersburg, MD 20899-8211

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
13010S	Special Tests of Optical Reference Planes (Flats): Optical Flat, ≤ 152 mm (6"), Per Surface	1207
13011S	Special Tests of Optical Reference Planes (Flats): Optical Flat, 152 mm to 203 mm (8")	1569
13012S	Special Tests of Optical Reference Planes (Flats): Optical Flat, 203 mm to 304 mm	2056
13013S	Special Tests of Optical Reference Planes (Flats): Optical Flat, ≥ 304 mm (12")	2573
13014S	Special Tests of Optical Reference Planes (Flats): Three Flat Calibration	At Cost
13020S	Special Test of Roundness (Sphere and Hemisphere Types) Reversal Method: Radial Deviations form Best Fit Least-Squares Circle at 360 positions.	1024
13030S	Special Tests of Roundness Calibration Specimens	At Cost

Fees are subject to change without notice.

E. Angular Measurements

Technical Contacts:

Bryon S. Faust
Theodore Doiron

Telephone:

(301) 975-4351
(301) 975-3472

Email:

bryon.faust@nist.gov
theodore.doiron@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8211
Gaithersburg, MD 20899-8211

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
14010C	Angle Gage Blocks: Set Up Charge, per order	154
14011C	Angle Block, per block	259
14020S	Special Tests of Optical Polygons	At Cost
14030S	Special Tests of Rotary and Indexing Tables: Every 30°	2025
14031S	Special Tests of Rotary and Indexing Tables: (30°, 5°, 1°) Calibration	3961

14040S	Special Tests of Optical Wedges: Fixed-Angle Wedge	707
14041S	Special Tests of Optical Wedges: Variable-Angle Wedge	At Cost
14050S	Special Angular Measurements, by Prearrangement	At Cost

Fees are subject to change without notice.

F. Laser Measurements

Technical Contact:

Jack Stone

Telephone:

(301) 975-5638

Email:

jack.stone@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8211

Gaithersburg, MD 20899-8211

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
14510S	Laser Frequency/Wavelength, Full Calibration	2233
14511S	Quick Check of Frequency at Laboratory Conditions	1175

Fees are subject to change without notice.

G. Surface Texture

Technical Contact:

C. Dewey Foreman, Jr.

Telephone:

(301) 975-5836

Email:

charles.foreman@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8211

Gaithersburg, MD 20899-8211

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
15010C	Roughness Calibration Specimens	1296
15030C	Step Height Measurements	1296
15040S	Surface Roughness and Topography Special Tests	At Cost

Fees are subject to change without notice.

CHAPTER 5

MECHANICAL MEASUREMENTS

A. Hydrometers

<u>Technical Contacts:</u> Sherry Sheckels John D. Wright	<u>Telephone:</u> (301) 975-5940 (301) 975-5937	<u>Email:</u> sherry.sheckels@nist.gov john.wright@nist.gov	<u>Mailing Address:</u> NIST 100 Bureau Drive, Stop 8361 Gaithersburg, MD 20899-8361
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Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
16010C	Reference Standard Hydrometers	2000
16020S	Hydrometers Special Tests	At Cost

Fees are subject to change without notice.

B. Volume and Density

<u>Technical Contacts:</u> Sherry Sheckels John D. Wright	<u>Telephone:</u> (301) 975-5940 (301) 975-5937	<u>Email:</u> sherry.sheckels@nist.gov john.wright@nist.gov	<u>Mailing Address:</u> NIST 100 Bureau Drive, Stop 8361 Gaithersburg, MD 20899-8361
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Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
17010C	Volume Standards	2000
17020C	Volume Standards > 380 L, 2 points	3001
17030C	Volume Standards > 380 L, 5 points	6001
17040S	Volume Special Tests	At Cost

Fees are subject to change without notice.

C. Flow Measurements

<u>Technical Contacts:</u>	<u>Telephone:</u>	<u>Email</u>	<u>Mailing Address:</u>
Gina Kline (Gas Flow and Hydrocarbon Flow)	(301) 975-4813	gina.kline@nist.gov	NIST 100 Bureau Drive, Stop 8361 Gaithersburg, MD 20899-8361
John D. Wright (Gas Flow and Water Flow)	(301) 975-5937	john.wright@nist.gov	
Sherry Sheckels (Hydrocarbon Flow)	(301) 975-5940	sherry.sheckels@nist.gov	

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
18010C	Gas Flow Meters	4500
18020C	Water Flow Meters	4521
18030C	Hydrocarbon Flow Meters	5499
18040C	Transfer Standards	At Cost
18050S	Gas Flow Special Tests	At Cost
18060S	Water Flow Special Tests	At Cost
18070S	Hydrocarbon Liquid Flow Special Tests	At Cost

Fees are subject to change without notice.

See 30063S Special Tests for Low-Gas-Flow Instrumentation

D. Flow Measurements at Cryogenic Temperatures

<u>Technical Contact:</u>	<u>Telephone:</u>	<u>Email</u>	<u>Mailing Address:</u>
Michael Lewis	(303) 497-3458	mlewis@boulder.nist.gov	NIST 325 Broadway, MC 838.09 Boulder, CO 80305-3328
Fax: (303) 497-5224			

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
18800S	Special Tests of Cryogenic Liquid Flow	At Cost

E. Air Speed Measurements

Technical Contacts:

J. Michael Hall
John D. Wright

Telephone:

(301) 975-5947
(301) 975-5937

Email:

j.hall@nist.gov
john.wright@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8361
Gaithersburg, MD 20899-8361

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
19010C	High Air Speed Instruments 1.3 m/s to 67 m/s (3 mph to 150 mph)	1701
19020C	Low Air Speed Instruments 0.3 m/s to 10.2 m/s (15 fpm to 2,000 fpm)	1701
19030S	High Air Speed special Tests	At Cost
19040S	Low Air Speed Special Tests	At Cost

Fees are subject to change without notice.

F. Mass Standards

Technical Contacts:

Jerry G. Keller
Zeina J. Jabbour

Telephone:

(301) 975-4218
(301) 975-4468

Email:

jerry.keller@nist.gov
zeina.jabbour@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8221
Gaithersburg, MD 20899-8221

Administrative and Logistics:

Jayson Diggs

(301) 975-6624 jayson.diggs@nist.gov

Fax: (301) 417-0514

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
22010C	Weight Set (1 mg to 100 g)	10126
22020C	Weight Set (1 mg to 1 kg)	11717
22030C	Weight Set (2 kg to 30 kg)	5004
22040C	Single Weights (1 mg to 1 kg)	1287
22060C	Single Weights (2 kg to 30 kg)	1627
22080C	Single Weights (> 30 kg to 1200 kg, 2 double substitution weighings)	At Cost
22100C	Single Weights (> 1200 kg to 30,000 kg)	At Cost
22110C	Single Weights (> 30 kg to 1200 kg, calibrated in a weighing design)	At Cost
22130C	Single Weights for Dead Weight Pressure Testers 5.9 kg to 22.7 kg (13 lb to 50 lb)	858
22140C	Single Weights for Dead Weight Pressure Testers 22.7 kg (> 50 lb)	At Cost
22150C	Single Weights for Dead Weight Pressure Testers 5.9 kg (> 13 lb)	655
22170S	Special Mass Measurement Services	At Cost

Fees are subject to change without notice.

G. Force Measurements

Technical Contacts:

Rick L. Seifarth
Thomas W. Bartel
Kevin L. Chesnutwood

Telephone:

(301) 975-6652
(301) 975-6461
(301) 975-6653

Email:

ricky.seifarth@nist.gov
tbartel@nist.gov
kchesnutwood@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8222
Gaithersburg, MD 20899-8222

Administrative and Logistics:

Jayson Diggs (301) 975-6624 jayson.diggs@nist.gov
Fax: (301) 417-0514

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
23010C	Force Transducers to 112 540 N (25 300 lbf) 1 mode	2560
23020C	Extra observation	51
23030C	Additional bridges	726
23040C	Force Transducers to 112 540 N (25 300 lbf) 2 modes	4179
23050C	Extra observation	51
23060C	Additional bridges	632
23070C	Force Transducers 112 540 N to 498 201 N (25 300 lbf to 112 000 lbf) 1 mode	2941
23080C	Extra observation	51
23090C	Additional bridges	721
23100C	Force Transducers 112 540 N to 498 201 N (25 300 lbf to 112 000 lbf) 2 modes	5708
23110C	Extra observation	1352
23120C	Additional bridges	1594
23130C	Force Transducers 498 205 N to 1 334 467 N (112 000 lbf to 300 000 lbf) 1 mode	5878
23140C	Extra observation	135
23150C	Additional bridges	997
23160C	Force Transducers 498 205 N to 1 334 467 N (112 000 lbf to 300 000 lbf) 2 modes	9550
23170C	Extra observation	217
23180C	Additional bridges	1793
23190C	Force Transducers 1 334 471 N to 4 448 222 N (300 00 lbf to 1 000 000 lbf)	7161
23200C	Extra observation	150
23210C	Additional bridges	1263

23220C	Force Transducers 1 334 471 N to 4 448 222 N (300 00 lbf to 1 000 000 lbf) 2 modes	11563
23230C	Extra observation	199
23240C	Additional bridges	2255
23250C	Force Transducers over 4 448 222 N (1 000 000 lbf) compression only	At Cost
23260S	Special Tests of Force Transducers	At Cost

Fees are subject to change without notice.

H. Vibration Measurements

Technical Contacts:

David J. Evans
Kari Harper
Toni Savoy

Telephone:

(301) 975-6637
(301) 975-6612
(301) 975-6613

Email:

david.evans@nist.gov
kari.harper@nist.gov
toni.savoy@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8220
Gaithersburg, MD 20899-8220

Administrative and Logistics:

Annie Sokol (301) 975-3506 annie.sokol@nist.gov
Fax: (301) 975-8058

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Freq. Range	Peak Accel.	Fee (\$)
24010C	Transducer Sensitivity	2 Hz to 160 Hz	0.2 g _n to 2 g _n	2517
24020C	Transducer Sensitivity	10 Hz to 3500 Hz	2 g _n to 10 g _n	4366
24030C	Transducer Sensitivity	10 Hz to 10 kHz	2 g _n to 10 g _n	7160
24040S	Shock Measurement	250 Hz to 10 kHz	20 g _n to 10 000 g _n	At Cost
24050S	Transducer Sensitivity	3 kHz to 20 kHz	4 g _n to 200 g _n	At Cost
24060S	Special Vibration Tests, by Prearrangement			At Cost

Fees are subject to change without notice.

I. Acoustic Measurements

Technical Contacts:

Victor Nedzelnitsky
Randall P. Wagner
David J. Evans

Telephone:

(301) 975-6638
(301) 975-6619
(301) 975-6637

Email:

vnedzelnitsky@nist.gov
randall.wagner@nist.gov
david.evans@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8221
Gaithersburg, MD 20899-8221

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
25010C	Pressure Response: WE Type 640AA microphones or equivalent (e.g., Tokyo Riko Type ECL MR103; Bruel & Kjaer Type 4160, Bruel & Kjaer Types 4144 or 4132 with DB0111 adapter), 50 Hz to 10,000 Hz	4392

Service ID Number	Description of Services	Fee (\$)
25020C	Pressure Response: WE Type 640AA microphones or equivalent (e.g., Tokyo Riko Type ECL MR103; Bruel & Kjaer Type 4160; Bruel & Kjaer Types 4144 or 4132 with DB0111 adapter), 50 Hz to 20,000 Hz	5298
25030C	Pressure Response: Tokyo Riko Type ECL MR112, Bruel & Kjaer Type 4134, or equivalent half-inch microphones, 50 Hz to 10,000 Hz	5047
25040C	Pressure Response: Tokyo Riko Type EC MR112, Bruel & Kjaer Type 4134, or equivalent half-inch microphones, 50 Hz to 20,000 Hz	6346
25050C	Free-Field Response: Tokyo Riko Type ECL MR112, Bruel & Kjaer Types 4133, 4134, 4165, 4166, 4180, or equivalent half-inch microphones, 2,500 Hz to 20,000 Hz	5265
25060S	Special Test of Acoustic Devices	At Cost
25070S	Special Tests of Earphones	4530

Fees are subject to change without notice.

CHAPTER 6

THERMODYNAMIC QUANTITIES

A. Pressure Measurements

<u>Technical Contacts:</u> Douglas A. Olson (All Services) R. Gregory Driver (pneumatic gages) (29010C, 29030C, 29035C, 29040S)	<u>Telephone:</u> (301) 975-2956 (301) 975-4832	<u>Email:</u> dolson@nist.gov rdriver@nist.gov	<u>Mailing Address:</u> NIST 100 Bureau Drive, Stop 8364 Gaithersburg, MD 20899-8364
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Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
29010C	Deadweight Piston Gages	6251
29020C	Controlled Clearance Piston Gages	At Cost
29030C	Pressure Gages and Transducers	At Cost
29035C	Non-mercurial Barometers and Manometers	At Cost
29040S	Special Tests of Pressure Gages	At Cost

Fees are subject to change without notice.

B. Vacuum, Low Pressure and Leak Measurements

<u>Technical Contacts:</u> Archie P. Miiller (30010C- 30025C, 30040S) Patrick J. Abbott (30029C- 30038C, 30050S, 30060S-30062C)	<u>Telephone:</u> (301) 975-5932 (301) 975-4838	<u>Email:</u> archie.miiller@nist.gov patrick.abbott@nist.gov	<u>Mailing Address:</u> NIST 100 Bureau Drive, Stop 8364 Gaithersburg, MD 20899-8364
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Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

NOTE: 1 Torr = 133.322 Pa

Service ID Number	Description of Services	Fee (\$)
30010C	One Low-Pressure Transducer Absolute or Differential Relative to Vacuum	4208
30011C	Additional Transducer (Cost per Unit)	4033
30020C	One Differential Low-Pressure Transducer Relative to near Atmospheric Pressure	4719
30021C	Additional Transducers (Cost per Unit)	4231
30025C	Piston Gauges versus and Ultrasonic Interferometer Manometer	At Cost
30029C	Spinning Rotor Gages, below 0.1 Pa, Nitrogen Gas with NIST Controller	3979
30030C	Spinning Rotor Gages, below 0.1 Pa, Nitrogen Gas Customer Controller with IEEE-488	3979
30031C	Spinning Rotor Gages, below 0.1 Pa, Additional Gas	4957

30032S	Special Test of Spinning Rotor Gages, Transition Range (above 0.1 Pa)	At Cost
30034C	Ionization Gages, 10^{-4} Pa to 10^{-1} Pa, Nitrogen Gas	4448
30035C	Ionization Gages, 10^{-5} Pa to 10^{-1} Pa, Nitrogen Gas	5455
30036C	Ionization Gages, 10^{-7} Pa to 10^{-1} Pa, Nitrogen Gas	6258
30037C	Ionization Gages, Additional Filament or Gas for Above Tests	At Cost
30038C	Ionization Gages, NIST Supplied Gage Tube for Above Tests	303
30040S	Special Tests of Low-Pressure Gages	At Cost
30050S	Special Tests of Vacuum Gages	At Cost
30060S	Special Tests of Leak Artifacts (10^{-13} mol/s to 10^{-6} mol/s)	At Cost
30061C	Helium Leaks, Primary Calibration (10^{-13} mol/s to 10^{-6} mol/s)	5533
30062C	Helium Leaks, Comparison Calibration (10^{-13} mol/s to 10^{-9} mol/s)	4333
30063S	Special Tests of Low-Gas-Flow Instruments	At Cost

Fees are subject to change without notice.

NOTE: Due to the time and effort required preparing vacuum instrumentation for calibration it is particularly important that they be known to be in proper operating condition when they are submitted to NIST. Equipment will be inspected upon receipt and the customer notified of any obvious damage. If the schedule permits, we will cooperate with the customer's efforts to repair or replace damaged equipment so that the calibration of their equipment can proceed. However, concealed damage or operational deficiencies most likely will not be detected before the instrument is operating on the vacuum system or the calibration has started; in such cases, **if the equipment cannot be calibrated, we will charge 20% of the regular calibration fee for low-pressure transducers and 30% of the regular fee for spinning rotor and ionization gages.**

C. Laboratory and Industrial-Grade Thermometers

Technical Contact:

C. Dawn Vaughn

Telephone:

(301) 975-4822

Email:

cvaughn@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8363
Gaithersburg, MD 20899-8363

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

NOTE: The minimum number of test points per thermometer is two. Fahrenheit ranges are not direct conversions of the Celsius ranges.

Service ID Number	Description of Services	Fee (\$)
31010C	Laboratory Thermometers (0 °C to 150 °C) (32 °F to 300 °F)	366/pt
31020C	Laboratory Thermometers (151 °C to 315 °C) (301 °F to 600 °F)	445/pt
31030C	Laboratory Thermometers (316 °C to 550 °C) (601 °F to 1022 °F)	445/pt
31040C	Laboratory Thermometers (-1 °C to -110 °C) (31 °F to -166 °F)	445/pt
31050C	Laboratory Thermometers (Liquid N ₂) (-196 °C or -321 °F)	366/pt
31100C	Quantity Tests of Liquid-In-Glass Thermometers	At Cost
31110S	Special Tests of Industrial Platinum Resistance Thermometers, Thermistor Thermometers, Digital Thermometers and Other Types of Thermometers (0 °C to 150 °C) (32 °F to 300 °F)	366/pt
31120S	Special Tests of Industrial Platinum Resistance Thermometers, Thermistor Thermometers, Digital Thermometers and Other Types of Thermometers (151 °C to 315 °C) (301 °F to 600 °F)	445/pt
31130S	Special Tests of Industrial Platinum Resistance Thermometers, Thermistor Thermometers, Digital Thermometers and Other Types of Thermometers (316 °C to 550 °C) (601 °F to 1022 °F)	445/pt
31140S	Special Tests of Industrial Platinum Resistance Thermometer, Thermistor Thermometers, Digital Thermometers and Other Types of Thermometers (-1 °C to -110 °C) (31 °F to -166 °F)	445/pt
31150S	Special Tests of Industrial Platinum Resistance Thermometers, Thermistor Thermometers, Digital Thermometers and Other Types of Thermometers (Liquid N ₂) (-196 °C or -321 °F)	366/pt
31170S	Special Tests of Calorimetric Thermometers	1395
31180S	Special Test of Beckmann Thermometers	1443
31190S	Additional copy of Table from Results of 31110S-31150S at a Later Date	330
31200S	Preliminary Examination of Ineligible Thermometer	82
31250S	Additional Copy of Report	82
31260S	Special Thermometry Services, by Prearrangement	At Cost

Fees are subject to change without notice.

D. Thermocouples, Thermocouple Materials, Thermometer Indicators**Technical Contacts:**

Christopher W. Meyer (32010C-32150S)

Karen Garrity

(32010C-32101C, 32150S)

C. Dawn Vaughn

(32110C-32147C)

Telephone:

(301) 975-4825

(301) 975-4818

(301) 975-4822

Email:

cmeyer@nist.gov

kgarrity@nist.gov

cvaughn@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8363

Gaithersburg, MD 20899-8363

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COMPARED CALIBRATIONS, TEMPERATURE MEASURED WITH THERMOCOUPLE						
Service ID Number	TC Type	Temp Range °C	Points	Min. Length (mm)	Temp. (°C)	Fee (\$)
32010C	S	0 to 1450	1 °C or 1 °F Interv. Table	700	0 to 1100 1450	1076
32020C	R	0 to 1450	1 °C or 1 °F Interv. Table	700	0 to 1100 1450	1076
32030C	B	0 to 1750	1 °C or 1 °F Interv. Table	1000	0 to 800 800 to 1100 1450 1750	1616
32031C	B	800 to 1750	1 °C or 1 °F Interv. Table	1000	800 to 1100 1450 1750	1076
32040C	E	0 to 1000	4 to 15	700	0 to 1000	1076
32041C	J	0 to 760	4 to 15	700	0 to 760	1076
32042C	K	0 to 1100	4 to 15	700	0 to 1100	1076
32043C	N	0 to 1100	4 to 15	700	0 to 1100	1076
32044C	T	0 to 400	4 to 15	700	0 to 400	1076
32050C	Comparison calibration, two point minimum, per point, for all items above					491/pt
32060C	Each additional table of results at 1 °C or 1 °F intervals, for type S, R, or B at later date					281
32061C	Each additional table of results at 1 °C or 1 °F intervals, for type S, R, or B at time of test					164
32070C	Thermocouple materials tested against Pt Thermoelectric standard, 4 to 15 points, 700 mm minimum lengths					1076

CALIBRATION AT METAL FREEZING POINTS, MINIMUM TC WIRE DIAMETER 0.4 mm, FREEZING POINT DETERMINATION AT Au, Ag, Al, AND Zn						
Service ID Number	TC Type	Temp Range °C	Points	Min. Length (mm)	Temp. (°C)	Fee (\$)
32090C	S or R	0 to 1450	Table 1 °C or 1 °F Interv. And equations to generate table	1000	at freezing points 0 to 1100 1450	2719
32091C	Type S or T, freezing point determination, per point, two point minimum					957
CALIBRATION OF DIGITAL THERMOMETER INDICATOR OR PORTABLE POTENTIOMETER						
32100C	Indicator or Potentiometer, first dial or range					809
32101C	Indicator or Potentiometer, each additional dial or range					448
COMPARISON CALIBRATION OF THERMOCOUPLES OR THERMOCOUPLE MATERIALS TESTED AGAINST Pt THERMOELECTRIC STANDARD, TEMPERATURE MEASURED WITH STANDARD PLATINUM RESISTANCE THERMOMETER, MINIMUM TC WIRE LENGTH 1.0 M, TWO POINT MINIMUM						
32110C	Range -110 °C to 315 °C and Liquid N ₂ (-196 °C) or -166 °F to 600 °F and Liquid N ₂ (-321 °F), Expanded Uncertainty 0.4 °C					524/pt
32120C	316 °C to 550 °C or 601 °F to 1022 °F, Expanded Uncertainty 0.5 °C					524/pt
Table at one degree intervals for Type T thermocouple for any of the following options: (The cost of the table will be in addition to the calibration per point covered under fee schedule services numbered 32110C-32120C).						
32141C	Option 1: Table from -196 °C to +300°C (-321 °F to +572 °F), calibration points at (-196, -110, 250, +100, +200, +300) °C					461
32142C	Option 2: Table from -196 °C to +100 °C (-321 °F to +212 °F), calibration points at (-196, -110, 250, +50, +100) °C					461
32143C	Option 3: Table from -110 °C to +300 °C (-166 °F to +572 °F), calibration points at (-110, 250, +100, +200, +300) °C					461
32144C	Option 4: Table from -110 °C to +100 °C (-166 °F to +212 °F), calibration points at (-110, 250, +50, +100) °C					461
32145C	Option 5: Table from 0 °C to 300 °C (32 °F to +572 °F), calibration points at (+100, +200, +300) °C					461
32146C	Option 6: Table from -110 °C to 0 °C (-166 °F to +32 °F), calibration points at (-110, 250) °C					461
32147C	Option 7: Table from -196 °C to 0 °C (-321 °F to +32 °F), calibration points at (-196, -110, 250) °C					461
32150S	Special Tests of Thermocouples and Thermocouple Materials					At Cost

Fees are subject to change without notice.

NOTE: Due to the extra time involved in calibrating sheathed thermocouples, a surcharge of 20% of the cost of calibrating bare-wire thermocouples will be added to the relevant fees listed above.

E. Resistance Thermometry

Technical Contacts:

Weston L. Tew (0.65 K to 84 K)
Gregory F. Strouse
(83K to 962 °C)

Telephone:

(301) 975-4811
(301) 975-4803

Email:

wtew@nist.gov
gstrouse@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8363
Gaithersburg, MD 20899-8363

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
33010C	Capsule SPRT (13.8 K to 30 °C) e-H ₂ to Ga	9435
33020C	Capsule SPRT (13.8 K to 157 °C) e-H ₂ to In	9923
33030C	Capsule SPRT (13.8 K to 232 °C) e-H ₂ to Sn	10882
33031C	Capsule SPRT (24.5 K to 30 °C) Ne to Ga	7461
33032C	Capsule SPRT (24.5 K to 157 °C) Ne to Ga	7859
33033C	Capsule SPRT (24.5 K to 232 °C) Ne to Sn	8819
33040C	Capsule SPRT(54 K to 30 °C) O ₂ to Ga	6624
33050C	Capsule SPRT (54 K to 157 °C) O ₂ to In	7023
33060S	Capsule SPRT (54 K to 232 °C) O ₂ to Sn	8619
30065S	Capsule SPRT (83 K to 0.01 °C) Ar to TPW	At Cost
30070C	Capsule SPRT (83 K to 30 °C) Ar to Ga	6477
33080C	Capsule SPRT (83 K to 157 °C) Ar to In	6477
33090C	Capsule SPRT (83 K to 232 °C) Ar to Sn	8251
33100C	Capsule SPRT (0 °C to 30 °C) TPW to Ga	2459
33110C	Capsule SPRT (0 °C to 157 °C) TPW to In	2859
33120C	Capsule SPRT (0 °C to 232 °C) TPW to Sn	4454
33130C	Capsule SPRT (234 K to 30 °C) Hg to Ga	4529
33140C	Rhodium-Iron or Platinum-Cobalt Resistance Thermometers (0.65 K to 24.6 K)	9945
33141C	Rhodium-Iron or Platinum-Cobalt Resistance Thermometers (0.65 K to 83.8 K)	12239
33142C	n-Type Germanium Resistance Thermometers (0.65 K to 24.6 K)	11238
33150C	Long Stem SPRT (83 K to 0.01 °C) Ar to TPW	3311
33160C	Long Stem SPRT (83 K to 30 °C) Ar to Ga	3897
33170C	Long Stem SPRT (83 K to 157 °C) Ar to In	4539
33180C	Long Stem SPRT (83 K to 232 °C) Ar to Sn	5093
33190C	Long Stem SPRT (83 K to 420 °C) Ar to Zn	6078

33200C	Long Stem SPRT (83 K to 661 °C) Ar to Al	7121
33210C	Long Stem SPRT (234 K to 30 °C) Hg to Ga	2713
33220C	Long Stem SPRT (234 K to 157 °C) Hg to In	3544
33230C	Long Stem SPRT (234 K to 232 °C) Hg to Sn	4341
33240C	Long Stem SPRT (234 K to 420 °C) Hg to Zn	5262
33250C	Long Stem SPRT (234 K to 661 °C) Hg to Al	6247
33260C	Long Stem SPRT (0 °C to 30 °C) TPW to Ga	1311
33270C	Long Stem SPRT (0 °C to 157 °C) TPW to In	1889
33280C	Long Stem SPRT (0 °C to 232 °C) TPW to Sn	2491
33290C	Long Stem SPRT (0 °C to 420 °C) TPW to Zn	3289
33300C	Long Stem SPRT (0 °C to 661 °C) TPW to Al	4454
33310C	Long Stem SPRT (0 °C to 962 °C) TPW to Ag	9045
33320C	Additional Copy of Table from Results of 33010C-33310C at Time of Test	108
33330C	Additional Copy of Table from Results of 33010C-33310C at a Later Date	324
33340C	Minimum Charge for Unsuitable Thermometer	301
33350S	Special Tests of Resistance Thermometers	At Cost
33355S	Special Tests of Cryogenic Resistance Thermometers	At Cost
33360S	Special Tests of Thermometric Fixed-Point Devices	At Cost
33370M	Measurement Assurance Program for Temperature 83 K to 420 °C (Ar to Zn)	21230
33380M	Measurement Assurance Program for Temperature 83 K to 661 °C (Ar to Al)	23401

Fees are subject to change without notice.

F. Radiance Temperature Measurements

Technical Contact:

Charles E. Gibson

Telephone:

(301) 975-2329

Email:

cgibson@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8441

Gaithersburg, MD 20899-8441

Fax: (301) 869-5700

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
Calibration reports are issued giving the radiance temperature of the blackbody at 655.3 nm versus the scale reading, output current, or output voltage		
35010C	Radiance Temperature Standard, Disappearing Filament Optical Pyrometer (800 °C to 2400 °C, 4 to 12 points, 1 range)	7045
35020C	Radiance Temperature Standard, Disappearing Filament Optical Pyrometers (each additional range up to 4200 °C, only available with 35010C)	5087
35040C	Radiance Temperature Standard, Disappearing Filament Optical Pyrometer (800 °C to 4200 °C, 1 range 3 or fewer points)	3522
Calibration reports are issued giving the radiance temperature of the lamp at 655.3 nm versus the lamp current		
35050C	Radiance Temperature Standard, Tungsten Strip Lamp (800 °C to 2300 °C, 6 to 16 points)	9783
35051C	Recalibration of Tungsten Strip Lamp (800 °C to 2300 °C, 6 to 16 points)	8218
35060C	Radiance Temperature Standard, Tungsten Strip Lamp (800 °C to 2300 °C, 5 or fewer points)	6261
35061C	Recalibration of Tungsten Strip Lamp (800 °C to 2300 °C, 5 or fewer points)	4696
Calibration reports are issued giving the radiance temperature of the reference blackbody at 655.3 nm, 900 nm or 1000 nm versus the display reading, output current, or output voltage		
35070S	Special Tests of Radiation Thermometers (800 °C to 2700 °C)	At Cost
35071C	Radiance Temperature Standard, Radiation Thermometer (800 °C to 2700 °C, 6 to 20 points)	7436
35072C	Radiance Temperature Standard, Radiation Thermometer (800 °C to 2700 °C, 5 or fewer points)	3914
Calibration reports are issued giving the thermodynamic temperature of the reference blackbody versus the display reading, output current, or output voltage.		
35080S	Special Tests of Radiation Thermometers (15 °C to 900 °C)	At Cost
35081C	Radiance Temperature Standard, Radiation Thermometer (15 °C to 70 °C, 3 points)	4131
35082C	Radiance Temperature Standard, Radiation Thermometer (70 °C to 170 °C, 3 points)	4131

35083C	Radiance Temperature Standard, Radiation Thermometer (400 °C to 700 °C, 3 points)	4131
35084C	Radiance Temperature Standard, Radiation Thermometer (700 °C to 900 °C, 3 points)	4131
Calibration reports are issued giving the thermodynamic temperature of the reference blackbody versus the test blackbody source display reading.		
35090S	Special Tests of Blackbody Sources (15 °C to 900 °C)	At Cost
Calibration reports are issued giving heat flux at the sensor surface versus the output voltage.		
35100S	Special Tests of Radiative Heat Flux Sensors	At Cost
35101C	Radiative Heat Flux Sensors (1 W/cm ² to 5 W/cm ² , 9 points, Gardon and Schmidt-Boelter type sensors)	3131
35102C	Additional Radiative Heat Flux Sensor (same model as 35101C)	2349

Fees are subject to change without notice.

Calibration Schedule: Requests for calibration services are scheduled after receipt of a purchase order.

G. Humidity Measurements

Technical Contacts:

Peter H. Huang
Joseph T. Hodges
Gregory E. Scace

Telephone:

(301) 975-2621 or 2626
(301) 975-2605
(301) 975-2626

Email:

phuang@nist.gov
jhodges@nist.gov
gregory.scace@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8363
Gaithersburg, MD 20899-8363
Fax: (301) 548-0206

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
36010C	Dew-Point Hygrometers (+25 °C to –15 °C)	5688
36020C	Dew-Point Hygrometers (-70 °C to –15 °C)	10803
36030C	Electric Hygrometers	At Cost
36040C	Electrolytic Hygrometers	At Cost
36050C	Aspirated Hygrometers	At Cost
36060C	Pneumatic Bridge Hygrometers	At Cost
36070S	Special Tests of Humidity	At Cost

Fees are subject to change without notice.

CHAPTER 7

OPTICAL RADIATION MEASUREMENTS

A. Photometric Measurements

Technical Contact:
Cameron Miller

Telephone:
(301) 975-4713

Email:
c.miller@nist.gov

Mailing Address:
NIST
100 Bureau Drive, Stop 8442
Gaithersburg, MD 20899-8442
Fax: (301) 840-8551

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
37010C	Luminous Intensity and Color Temperature Standard Lamps	4223
37020S	Special Tests for luminous Intensity and Color Temperature of Submitted Lamps	At Cost
37030C	Color Temperature Standard Lamps	3429
37040C	Each Additional Color Temperature for 37030C	781
37050S	Special Tests for Color Temperature of Submitted Lamps	At Cost
37060S	Special Tests for Total Luminous Flux of Submitted Incandescent Lamps and Florescent Lamps	At Cost
37070C	Opal Glass Luminance Coefficient Standards	3037
37080S	Special Tests for Submitted Luminance Sources and Transmitting Diffusers	At Cost
37090S	Special Tests for Photometers, Illuminance Meters and Luminance Meter	At Cost
37100S	Special Photometric Tests	At Cost
37110S	Special Tests for Submitted Flashing-Light Photometers	At Cost
37120S	Special Tests for Color Measuring Instruments for Displays	At Cost
37130S	Special Tests for Luminous Intensity and Luminous Flux of LEDs	At Cost

Fees are subject to change without notice.

B. Optical Properties of Materials Measurements

Technical Contacts:

David W. Allen
Maria E. Nadal
(38010C-38091S)

Telephone:

(301) 975-3680
(301) 975-4632

Email:

david.allen@nist.gov
maria.nadal@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8442
Gaithersburg, MD 20899-8442
Fax: (301) 840-8551

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
38010C	Spectral Transmittance Filters (Cobalt Blue Glass)	3676
38020C	Spectral Transmittance Filters (Copper Green Glass)	3676
38030C	Spectral Transmittance Filters (Carbon Yellow Glass)	3676
38040C	Spectral Transmittance Filters (Selenium Orange Glass)	3676
38050C	Wavelength Standards (Holmium Oxide Glass)	3025
38051C	Wavelength Standards	3025
38060S	Special Tests of Spectral Reflectance	At Cost
38061S	Special Tests of Spectral Transmittance	At Cost
38090S	Specular Gloss	At Cost
38091S	Special Test of 0°/45° Surface Color	At Cost

Fees are subject to change without notice.

C. Spectroradiometric Measurements

Technical Contacts:

Charles E. Gibson
(39010C-39060S)
Jeanne M. Houston
(39071C-39081S)
Thomas C. Larason
(39080S, 39081S, 39100S)
George Eppeldauer (39090S)

Telephone:

(301) 975-2329

Email:

cgibson@nist.gov
jeanne.houston@nist.gov
tlarason@nist.gov
geppeldauer@nist.gov

Mailing/Shipping Address:

NIST
100 Bureau Drive, Stop 8441
Gaithersburg, MD 20899-8441
Fax: (301) 869-5700

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C.1 Spectroradiometric Source Measurements		
Service ID Number	Description of Services	Fee (\$)
NIST calibrates and issues a type 30A/T24/13 tungsten strip lamp with a mogul bi-post base.		
39010C	Spectral Radiance Standard, Tungsten Strip Lamp (225 nm to 2400 nm) (other spectral ranges are available under no. 39060S)	13912
NIST calibrates customer supplied integrating sphere sources and maps the source aperture.		
39020C	Spectral Radiance Standard, Integrating Sphere Source (300 nm to 1000 nm in	7668

	25 nm steps)	
39021C	Spectral Radiance Standard, Integrating Sphere Source (300 nm to 2400 nm in 25 nm steps)	10799
NIST calibrates and issues an 1000 W, tungsten quartz-halogen lamp mounted in a medium bi-post base. The calibrations are performed at 50 cm.		
39030C	Spectral Irradiance Standard, 1000 W Tungsten Quartz-Halogen Lamp (250 nm to 450 nm)	10184
39031C	Recalibration of 1000 W Tungsten Quartz-Halogen Lamp (250 nm to 450 nm)	7117
39032C	Spectral Irradiance Standard, 1000 W Tungsten Quartz-Halogen Lamp (350 nm to 800 nm)	10184
39033C	Recalibration of 1000 W Tungsten Quartz-Halogen Lamp (350 nm to 800 nm)	7117
39040C	Spectral Irradiance Standard, 1000 W Tungsten Quartz-Halogen Lamp (250 nm to 1600 nm)	12764

39041C	Recalibration of 1000 W Tungsten Quartz-Halogen Lamp (250 nm to 1600 nm)	9697
39045C	Spectral Irradiance Standard, 1000 W Tungsten Quartz-Halogen Lamp (250 nm to 2400 nm)	15032
39046C	Recalibration of 1000 W Tungsten Quartz-Halogen Lamp (250 nm to 2400 nm)	12045
NIST calibrates and issues a 30 W deuterium arc lamp mounted in a medium bi-post base.		
39050C	Spectral Irradiance Standard, 30W Deuterium Arc Lamp (200 nm to 400 nm)	12992
39051C	Recalibration of 30 W Deuterium Arc Lamp (200 nm to 400 nm)	9465
39060S	Special Tests of Radiometric Sources	At Cost
C.2 Spectroradiometric Detector Measurements		
39071C	UV Silicon Photodiodes	4386
39072C	Recalibration of UV Silicon Photodiodes	3341
39073C	Visible to NIR Silicon Photodiodes	4479
39074C	Recalibration of Visible to NIR Silicon Photodiodes	3341
39075S	Special Tests of NIR Photodiodes	At Cost
39077C	UV to Near-Infrared Silicon Photodiodes (Hamamatsu S2281)	5313
39078C	Recalibration of UV to Near-Infrared Silicon Photodiodes (Hamamatsu S1337-1010BQ or S2281)	4176
39080S	Special Tests of Radiometric Detectors	At Cost
39081S	Special Tests of Photodetector Responsivity Spatial Uniformity	At Cost
39090S	Special Tests of IR Detectors	At Cost
39100S	Special Tests of Irradiance Detectors	At Cost

Fees are subject to change without notice.

D. Radiometric Standards in the Ultraviolet

Standard Detectors in the Far Ultraviolet

Technical Contact:

Robert E. Vest

Telephone:

(301) 975-3992

Email:

rvest@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8411
Gaithersburg, MD 20899-8411

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
40510C	Detector Standard, Windowless Photodiode (5 nm to 122 nm)	3657
40511C	Recalibration of Detector Standard (5 nm to 122 nm)	3293
40520C	Detector Standard, Windowless Photodiode (18 nm to 122 nm)	2595
40521C	Recalibration of Detector Standard (18 nm to 122 nm)	2232
40530C	Detector Standard, Windowless Photodiode (52 nm to 122 nm)	1533
40531C	Recalibration of Detector Standard (52 nm to 122 nm)	1171
40540C	Uncalibrated Windowless Photodiode	667
40560C	Detector Standard, Windowless Photodiode (116 nm to 254 nm)	12188
40561C	Recalibration of Detector Standard (116 nm to 254 nm)	1171
40599S	Special Tests on Detectors from the Ultraviolet (254 nm) to the Soft X-Ray Region (5 nm)	At Cost

Fees are subject to change without notice.

E. Laser and Optoelectronic Components Used with Lasers

<u>Technical Contacts:</u>	<u>Telephone:</u>	<u>Email:</u>	<u>Mailing Address:</u>
John H. Lehman (CW Laser Radiometry)	(303) 497-3654	lehman@boulder.nist.gov	NIST 325 Broadway, MC 815.01
Paul D. Hale (High Speed Measurements)	(303) 497-5367	hale@boulder.nist.gov	Boulder, CO 80305-3328
Christopher L. Cromer (Pulsed-Laser Radiometry)	(303) 497-5620	cromer@boulder.nist.gov	
Timothy Drapela (Optical Fiber and Component Measurements [other than Fiber Power])	(303) 497-5858	drapela@boulder.nist.gov	

Administrative and Logistics:

Maggie Mills (303) 497-4285 caliopto@boulder.nist.gov
FAX: (303) 497-4286

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
42110C	Laser Power and Energy Meter (or Detector) Calibrations at a Single Standard Wavelength and Power (See Table 4)	
	CW Laser Power below 2 Watts	3139
	Pulsed Laser Energy (Q-switched YAG) at 1064 nm	3265
	CW Laser Power at 1064 nm above 2 Watts and 10.6 μ m	4079
	Pulsed Laser Energy (Excimer) at 248 nm and 193 nm	4166
42111C	Same as 42110C, Additional Standard Wavelengths or Powers (See Table 4)	
	CW Laser Power below 2 Watts	1569
	Pulsed Laser Energy (Q-switched YAG) at 1064 nm	2448
	CW Laser Power at 1064 nm above 2 Watts and 10.6 μ m above 1 Watt	3265
	Pulsed Laser Energy (Excimer) at 248 nm and 193 nm	3057
42120M	Laser Power and Energy Measurement Assurance Program (MAP)	At Cost
42130C	Optical Fiber Power Meter (or Detectors Used with Lasers) Calibrations at a Single Standard Wavelength and Connector Type (See Table 5)	2264
42131C	Same as 42130C, Additional Standard Wavelengths or Connector Types (See Table 5)	906
42140M	Optical Fiber Power Meter Measurement Assurance Program (MAP)	At Cost
42150M	Low-Level Laser Measurement Assurance Program (MAP)	At Cost
42151C	Low-Level Laser Radiometer Calibration	At Cost
42155C	Calibration Service of Optoelectronic Frequency Response for Combined Photodiode/RF Power Sensor Transfer Standards	At Cost
42160S	Special Test for Frequency Response Measurements of Detectors Used with Lasers	At Cost

42161S	Special Test for Impulse Response Measurements of Detectors Used with Lasers	At Cost
42162S	Special Test for High Accuracy Laser and Optical Fiber Power Measurements	At Cost
42164C	Spectral Responsivity Measurements of Laser and Optical Fiber Power Meters (or Detectors Used with Lasers)	2825
42165S	Special Test for Spatial Uniformity of Laser and Optical Fiber Power Meters and Detectors Used with Lasers	At Cost
42166C	Calibration for Linearity Measurements of Optical Fiber Power Meters (or Detectors Used with Lasers)	At Cost
42167S	Special Test for Linearity Measurements of High-Power Laser Power Meters (or Detectors Used with Lasers)	At Cost
42170S	Special Test for General Laser Measurements, by Prearrangement	At Cost
42180S	Special Test for General Optical Fiber Power Measurements, by Prearrangement	At Cost
42190S	Special Test for Optical Fiber and Fiber Component Measurements (other than Fiber Power) by Prearrangement	At Cost
42210C	Spectral Responsivity Measurements with Curve Fitting of Laser and Optical Meters (or Detectors used with Lasers)	3139

Fees are subject to change without notice.

CHAPTER 8

IONIZING RADIATION MEASUREMENTS

A. Radioactivity Sources

<u>Technical Contacts:</u> Lisa R. Karam (All Services) M.P. Unterweger (43030C, 43040C, 43070S, 43090S) Jeffrey T. Cessna (43010C, 43020C, 43060C, 43070S) Lynne Nason (43030C, 43040C, 43070S, 43090S)	<u>Telephone:</u> (301) 975-5561 (301) 975-5536 (301) 975-5539 (301) 975-5544	<u>Email:</u> lisa.karam@nist.gov munterweger@nist.gov jcessna@nist.gov lynne.nason@nist.gov	<u>Mailing Address:</u> NIST 100 Bureau Drive, Stop 8462 Gaithersburg, MD 20899-8462 Attn: Jeffrey Cessna
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Administrative and Logistics:
 Jeffrey Cessna (301) 975-5539 jcessna@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
43010C	Gamma-Ray-Emitting Radionuclides in Solution (Half Lives Greater than 15 Days)	2300
43020C	Gamma-Ray-Emitting Radionuclides in Solution (Half Lives Less than 15 Days)	3849
43030C	Alpha-Particle-Emitting Solid Sources, NIST 2 π Proportional Counter	1610
43040C	Alpha-Particle-Emitting Solid Sources, NIST 0.8 π Defined-Solid-Angle Counter	1593
43050C	Alpha-Particle-Emitting Solid Sources, Using Both Counting Systems	3158
43060S	Special Tests of Beta-Particle-Emitting Solution Sources, Liquid Scintillation Counting	4713
43070S	Special Tests of Beta-Particle-Emitting Solution Sources, Other Techniques	At Cost
43090S	Special Tests of Alpha-Particle-Emitting Solid Sources	At Cost

Fees are subject to change without notice.

B. Neutron Sources and Neutron Dosimetry

<u>Technical Contacts:</u>	<u>Telephone:</u>	<u>Email:</u>	<u>Mailing Address:</u>
M. Scott Dewey (All Services Except 44060C)	(301) 975-4843	mdewey@nist.gov	NIST 100 Bureau Drive, Stop 8461 Gaithersburg, MD 20899-8461
Alan K. Thompson (44060C, 44100S)	(301) 975-4666	alan.thompson@nist.gov	

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
44010C	Radioactive Neutron Sources Emission Rates (10^{-5} s^{-1} to 10^{-9} s^{-1})	5109
44020C	Radioactive Neutron Sources Emission Rates (10^{-8} s^{-1} to 10^{-10} s^{-1})	5109
44060C	Personnel Protection Instrumentation, Californium Source Bare and Moderated	At Cost
44070C	Activation Detector Dosimetry, Thermal Neutrons	At Cost
44080C	Activation Detector Dosimetry, Californium Fission Neutrons	At Cost
44090C	Activation Detector Dosimetry, ^{235}U Cavity Fission Sources	At Cost
44100S	Special Test of Neutron Sources and Dosimeters	At Cost

Fees are subject to change without notice.

C. Dosimetry of X-Rays, Gamma-Rays, and Electrons

<u>Technical Contacts:</u>	<u>Telephone:</u>	<u>Email:</u>	<u>Mailing Address:</u>
Stephen M. Seltzer (All Services)	(301) 975-5552	s.seltzer@nist.gov	NIST
Michael Mitch (46010C-47040S)	(301) 975-5491	mmitch@nist.gov	100 Bureau Drive, Stop 8460 Gaithersburg, MD 20899-8460
Michelle O'Brien (46010C-46050S)	(301) 975-2014	michelle.obrien@nist.gov	Fax: (301) 869-7682
Ronaldo Minniti (46010C-46110C)	(301) 975-5586	ronaldo.minniti@nist.gov	
Heather Chen-Mayer (46110C)	(301) 975-5595	heather.chen-mayer@nist.gov	
Christopher G. Soares (47030C-47040S)	(301) 975-5589	csoares@nist.gov	

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

C.1 X-Ray and Gamma-Ray Measuring Instruments		
Service ID Number	Description of Services	Fee (\$)
Air-Kerma (Exposure)		
46010C	Radiation Detectors—Calibration in ^{60}Co and ^{137}Cs Gamma-Ray Beams	1708
46011C	Radiation Detectors—Calibration in X-Ray Beams (see Tables 6, 7 and 8)	1410
46020C	Passive Dosimeters—Irradiation of Up to Six, One Beam Quality at One Set-up	1708
46021C	Up to Six Additional Dosimeters at Same Set-up and Beam Quality	1083

46030S	Special Tests of High-Gain Electrometers—Charge Sensitivity, One Set of Switch Positions, with 46010C/46011C, by Prearrangement	1127
46040S	Special Tests of kV Measuring Devices	At Cost
46050S	Special Tests of X-Ray and Gamma-Ray Measuring Instruments	At Cost
Absorbed Dose to Water From ⁶⁰Co Beam		
46110C	Radiation Detectors—Calibration in a ⁶⁰ Co Gamma-Ray Beam	2010
C.2 Sealed Gamma-Ray Sources or Beta-Particle Sources, and Measuring Instruments		
47010C	Gamma-Ray Sources Similar to NIST Standards— ⁶⁰ Co to ¹³⁷ Cs, Having Air-Kerma Strengths 10 $\mu\text{Gy m}^2/\text{h}$ to 1500 $\mu\text{Gy m}^2/\text{h}$; and ¹⁹² Ir Sources of the Same Type Used to Calibrate Reentrant Chamber, Having Air-Kerma Strengths 0.1 $\mu\text{Gy m}^2/\text{h}$ to 30 $\mu\text{Gy m}^2/\text{h}$	3210
47011C	Each Additional Gamma-Ray Source of Same Radionuclide	3106
47020C	¹²⁵ I or ¹⁰³ Pd Sources: Seeds Having Air-Kerma Strengths 0.5 $\mu\text{Gy m}^2/\text{h}$ to 100 $\mu\text{Gy m}^2/\text{h}$	3210
47021C	Each Additional ¹²⁵ I or ¹⁰³ Pd Source of Same Radionuclide/Design Submitted with Above	3106
47030C	Beta-Particle Source Calibrated for Surface Dose Rate	2089
47035C	Beta-Particle Source Calibrated for Radiation Protection	1671
47036C	Ionization Chamber Calibrated with Beta-Particle Sources for Radiation Protection	1671
47040S	Special Tests of Gamma-Ray and Beta-Particle Sources	At Cost

Fees are subject to change without notice.

D. Dosimetry for High-Dose Applications

Technical Contacts:

Stephen M. Seltzer
 Marc D. Desrosiers
 James M. Puhl

Telephone:

(301) 975-5552
 (301) 975-5639
 (301) 975-5581

Email:

s.seltzer@nist.gov
 mdesrosiers@nist.gov
 jpuhl@nist.gov

Mailing Address:

NIST
 100 Bureau Drive, Stop 8460
 Gaithersburg, MD 20899-8460

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
D.1 Dosimetry of High-Energy Electron Beams		
48010M	Dose Interpretation of NIST-Packaged Dosimeters Irradiated by Customer—Two Dosimeters	920
48011M	Each Additional Dosimeter	469
48020S	Special Tests of Electron-Beam Dosimeters	At Cost
D.2 Dosimetry of Photon Beams		
49010C	Calibration Irradiations of Customer Supplied Dosimeters with ⁶⁰ Co Gamma-Rays	853

49020C	Dose Interpretation of NIST Transfer Dosimeters Irradiated by Customer, Three Dosimeters Plus Control(s)	2549
49030C	Dose Interpretation of Each NIST Transfer Dosimeter Package in Addition to Those Supplied Under 49020C	623
49050S	Special Measurement Services for Dosimeter Response and Dose Distributions	At Cost

Fees are subject to change without notice.

CHAPTER 9

ELECTROMAGNETIC MEASUREMENTS

A. Resistance Measurements

A.1 DC Resistance Standards and Measurements

<u>Technical Contacts:</u> George R. Jones Randolph E. Elmquist	<u>Telephone:</u> (301) 975-4225 (301) 975-6591	<u>Email:</u> george.jones@nist.gov relmquist@nist.gov	<u>Mailing Address:</u> NIST 100 Bureau Drive, Stop 8170 Gaithersburg, MD 20899-8170
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<u>Administrative and Logistics:</u> Denise D. Prather	(301) 975-4221	dprather@nist.gov
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Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
51100S	Special Resistance Measurements Services, by Prearrangement	At Cost
51110M	Measurement Assurance Program for Resistance	At Cost
51130C	Standard Resistor, Thomas-Type, 1 Ω	1796
51131C	Standard Resistor, Evanohm Wirewound High Precision, 10 k Ω	1683
51132C	Standard Resistor, Four-Terminal 0.0001 Ω	1893
51133C	Standard Resistor, Four-Terminal 0.001 Ω	1614
51134C	Standard Resistor, Four-Terminal 0.01 Ω	1614
51135C	Standard Resistor, Four-Terminal 0.1 Ω	1195
51136C	Standard Resistor, Four-Terminal 1 Ω	1195
51137C	Standard Resistor, Four-Terminal 10 Ω	1195
51138C	Standard Resistor, Four-Terminal 100 Ω	1195
51139C	Standard Resistor, 1 k Ω	1588
51140C	Standard Resistor, 10 k Ω	1588
51141C	Standard Resistor, 100 k Ω	1588
51142C	Standard Resistor, 1 M Ω	1866
51143C	Standard Resistor, 10 M Ω	2019
51144C	Additional Voltage, 10 M Ω	1656
51145C	Standard Resistor, 100 M Ω	2019
51146C	Additional Voltage, 100 M Ω	1656
51147C	Standard Resistor, 1 G Ω	2019
51148C	Additional Voltage, 1 G Ω	1656

51149C	Standard Resistor, 10 GΩ	2576
51150C	Additional Voltage, 10 GΩ	2213
51151C	Standard Resistor, 100 GΩ	2576
51152C	Additional Voltage, 100 GΩ	2213
51153C	Standard Resistor, 1 TΩ	2716
51154C	Additional Voltage, 1 TΩ	2632
51160C	Standard Resistor for Current Measurements (Shunts) with all determinations at 300 A or Below, One Range, One Current Level	2700
51161C	Standard Resistor for Current Measurements (Shunts), with At Least One Determination Above 300 A (maximum current 2000 A), One Range, One Current Level	3342
51162C	Standard Resistor for Current Measurements (Shunts), Additional Range of a Multi-Range Resistor	1717
51163C	Standard Resistor for Current Measurements (Shunts), Additional Determination at Another Current Level	1717

Fees are subject to change without notice.

A.2 High-Voltage Standard Resistors

Technical Contacts:

Ken L. Stricklett
Gerald J. FitzPatrick

Telephone:

(301) 975-3955
(301) 975-8922

Email:

kstricklett@nist.gov
gfitzpatrick@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather (301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
51210C	High-Voltage Standard Resistors	At Cost

A.3 High-Frequency Standard Resistors

Technical Contact:

George M. Free

Telephone:

(303) 497-3609

Email:

free@boulder.nist.gov

Mailing Address:

NIST
325 Broadway, MC 818.01
Boulder, CO 80305-3328

Administrative and Logistics:

Puanani L. DeLara

(303) 497-3753

calibration@boulder.nist.gov

Fax: (303) 497-3970

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
51310S	High-Frequency Standard Resistors; Two-Terminal	At Cost

B. Impedance Measurements (Except Resistors)

B.1 Low-Frequency Capacitance and Inductance Measurements and Standards

Technical Contacts:

Andrew D. Koffman

Telephone:

(301) 975-4518

Email:

akoffman@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather

(301) 975-4221

dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
52100S	Special Four Terminal-Pair (4TP) Capacitance and Dissipation Factor Characterization	At Cost
52110S	Special LF Capacitance Measurements, by Prearrangements	At Cost
52120S	Special Measurement Assurance Program for Standard Capacitors (100 pF and 1000 pF, at a Frequency of 1000 Hz)	At Cost
52130C	Fixed, Fused-Silica Dielectric Standard Capacitors (1, 10, and 100) pF, at a Frequency of (100, 400, or 1000) Hz	2527
52131C	Additional Measurement at One of the Above Frequencies	261
52140C	Fixed Three-Terminal, High-Precision Nitrogen Dielectric Standard Capacitors with Coaxial Connectors, Small Uncertainty, (10, 100 and 1000) pF, at a Frequency of (100, 400, or 1000) Hz	1617
52141C	Additional Measurement at One of the Above Frequencies	261
52150C	Physical Tests for Three-Terminal Standard Capacitors with Coaxial Connectors, Large Uncertainty (0.001 pF to 10 000 pF) at a Frequency of (100, 400, or 1000) Hz	1577
52160C	Fixed Three-Terminal Standard Capacitors with Coaxial Connectors, Large Uncertainty (0.001 pF to 10 000 pF) at a Frequency of (100, 400, or 1000) Hz	1050

52161C	Additional Measurement at One of the Above Frequencies	261
52170C	Two- or Three- Terminal Mica Dielectric Standard Capacitors with Binding Post Connectors (0.001 μ F to 1 μ F), at a Frequency of (66, 100, 400, 1000 or 10 000) Hz	1050
52171C	Additional Measurement at One of the Above Frequencies	261
52176C	Two-Terminal Standard Capacitors with Precision High Frequency (HF) Coaxial Connectors (0.001 pF to 10 000 pF), at a Frequency of 1000 Hz	At Cost
52180C	Fixed Standard Inductors (0.00005 H to 10 H), at a Frequency of (100, 400, 1000, or 10 000) Hz	1050
52181C	Additional Measurement at One of the Above Frequencies	1008
52190S	Special LF Inductance Measurements, by Prearrangement	At Cost

Fees are subject to change without notice.

B.2 High-Frequency Standard Capacitors and Inductors

Technical Contact:

George M. Free

Telephone:

(303) 497-3609

Email:

free@boulder.nist.gov

Mailing Address:

NIST
325 Broadway, MC 818.01
Boulder, CO 80305-3328

Administrative and Logistics:

Puanani L. DeLara (303) 497-3753 calibration@boulder.nist.gov

Fax: (303) 497-3970

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
52210S	Two-Terminal Low-Loss Standard Capacitors—10 kHz to 250 MHz; 1 pF to 20 pF	At Cost
52211S	Two-Terminal Low-Loss Standard Capacitors (High Accuracy)—10 kHz to 30 MHz, (50, 100, 200, 500 and 1000) pF	1009
52221C	Three-Terminal Low-Loss Standard Capacitors (High Accuracy)—10 kHz to 10 MHz, (10^{-2} , 10^{-1} , 1, 10, 10^2 and 10^3) pF	1069
52310S	Two-Terminal, High- <i>Q</i> Standard Inductors (10^{-2} μ H to 1 H)	1069

Fees are subject to change without notice.

B.3 Power-Frequency Capacitors

Technical Contacts:

Gerald J. FitzPatrick

Telephone:

(301) 975-8922

Email:

gfitzpatrick@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather

(301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
52400C	Power-Frequency Capacitors	At Cost

B.4 *Q*-Standards

Technical Contact:

George M. Free

Telephone:

(303) 497-3609

Email:

free@boulder.nist.gov

Mailing Address:

NIST

325 Broadway, MC 818.01
Boulder, CO 80305-3328

Administrative and Logistics:

Puanani L. DeLara

(303) 497-3753 calibration@boulder.nist.gov

Fax: (303) 497-3970

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
52710C	Inductive <i>Q</i> -Standards; 50 kHz to 45 MHz, 0.25 μ H to 25 mH	834
52711C	Each Additional Frequency for 52710C	117

Fees are subject to change without notice.

C. Voltage Measurements

C.1 DC Voltage Measurements and Standards

Technical Contacts:

June E. Sims

Yi-hua Tang

Telephone:

(301) 975-4238

(301) 975-4691

Email:

june.sims@nist.gov

ytang@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather

(301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
53110S	Special DC Voltage Measurements, by Prearrangement	At Cost
53130C	First Saturated Standard Cell in a Group	1764
53131C	Each Additional Cell	1188
53140C	Platinum Resistance Thermometer Temperature Determination for Standard Cell Calibration	419
53150C	Unsaturated Standard Cells	997
53160C	Tests of Solid-State Voltage Reference Standard (1 Output, 1 V to 10 V)	1573
53161C	Each Additional Output	997
53180S	Special Handling (Equipment Pickup or Delivery)	191
53190S	Special Handling (Cleaning, Minor Repair, Return Service Charge)	385

Fees are subject to change without notice.

C.2 AC Voltage Measurements

Technical Contacts:

Mark E. Parker

Bryan C. Waltrip

Telephone:

(301) 975-2413

(301) 975-2438

Email:

mparker@nist.gov

bwaltrip@nist.gov

Mailing Address:

NIST

100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather

(301) 975-4221 dprather@nist.gov

Service ID Number	Description of Services	Fee (\$)
53200S	Special Tests of High-Accuracy Digital Multimeters, Multifunction Calibrators, by Prearrangement	At Cost
53201S	Special Tests of Low-Voltage AC-DC Transfer Standards, by Prearrangement	At Cost
53202S	Special 25-Point Test of Digital Multimeters (DMMs), by Prearrangement	1407
53203S	Each Additional DMM Test Point for 53202S	At Cost

Fees are subject to change without notice.

C.3 AC-DC Thermal Voltage and Current Converters (to 1 MHz)

Technical Contacts:

Joseph R. Kinard
Thomas E. Lipe

Telephone:

(301) 975-4250
(301) 975-4251

Email:

jkinard@nist.gov
tlpe@nist.gov

Mailing Address:

NIST
Building 220, Room B146
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather

(301) 975-4221 dprather@nist.gov

Service ID Number	Description of Services	Fee (\$)
53310S	Special AC-DC Measurement Services, by Prearrangement	At Cost
53350C	Set-up Charge (No Test Points Included) for a Standard or Standards Set for AC-DC Difference (Voltage or Current)	1611
53351C	First Point for Each Applied Voltage or Current Range	828
53352C	Additional Points for Each Applied Voltage and Current Level (Additional Frequency/Voltage or Frequency/Current Points)	73

Fees are subject to change without notice.

C.4 RF-DC Thermal Voltage and Current Converters (100 Hz-1 GHz)

Technical Contact:

George M. Free

Telephone:

(303) 497-3609

Email:

free@boulder.nist.gov

Mailing Address:

NIST
325 Broadway, MC 818.01
Boulder, CO 80305-3328

Administrative and Logistics:

Puanani L. DeLara

(303) 497-3753 calibration@boulder.nist.gov

Fax: (303) 497-3970

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
53405S	Special Tests of AC Thermal Voltage Converters, by Prearrangement	At Cost
53410C	Low Frequency TVC Calibration at One Frequency Selected from Those Given in Table 9.8 at Rated Voltage in the Range 0.1 V to 50 V	1321
53411C	Additional Frequency Selected from Table 9.8 for Same TVC as in 53410C	323
53412S	Same as 53410C, Except Customer Designates a Single Frequency (in Same Frequency Range) Other Than Those Given in Table 9.8	951
53413C	Low Frequency TVC Calibration at One Frequency Selected from Those Given in Table 9.8 at Rated Voltage in the Range 50 V to 200 V	1378
53414C	Additional Frequency TVC Calibration at One Frequency Selected from Those Given in Table 9.9 at Rated Voltage in the Range 0.2 V to 7.0 V	396
53415S	Same as 53413C, Except Customer Designates a Single Frequency (in Same Frequency Range) Other Than Those Given in Table 9.8	At Cost

53420C	High Frequency TVC Calibration at One Frequency Selected from Those Given in Table 9.9 at Rated Voltage in the Range 0.2 V to 7.0 V	1731
53421C	Additional Frequency Selected from Table 9.9 for Same TVC as in 53420C	351
53430S	Peak-to-Peak Detector Calibration at One Frequency Selected from Those Given in Table 9.10 at 1.2 V Peak-to-Peak Applied RF Voltage	1361
53431S	Additional Frequency for Peak-to-Peak Detector in 53430S	263
53440S	Special Test of RF Micropotentiometers, by Prearrangement	At Cost
53441C	RF Micropotentiometer Calibration at One Frequency Selected from the Frequency Banks Given in Table 9.11	733
53445S	Special Calibration of RF Micropotentiometer (Output Voltage Range, 200 μ V to 200 000 μ V at Frequency Range, 0.05 MHz to 1000 MHz) with Reduced Limits of Uncertainty	At Cost

Fees are subject to change without notice.

D. Precision Ratio Measurements

D.1 Inductive Dividers

Technical Contact:

Ken Stricklett
Andrew Secula

Telephone:

(301) 975-3955
(301) 975-4243

Email:

ken.stricklett@nist.gov
asecula@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather

(301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
54110S	Special Ratio Measurements and Tests of Inductive Voltage Dividers, by Prearrangement	At Cost
54120C	Inductive Voltage Dividers – (Single Frequency, Voltage to be Specified, Each Setting of 3 Most Significant Dials)	3424
54121C	Additional Frequency Points	3424
54130C	Inductive Voltage Dividers – (Single Frequency, Voltage to be Specified, Each Setting of Most Significant Dial Only)	2157
54131C	Additional Frequency Points	2157

Fees are subject to change without notice.

D.2 Resistive Dividers

Technical Contacts:

Ken L. Stricklett
(DC Measurements)
Gerald J. FitzPatrick
(60 Hz/Pulsed Measurements)

Telephone:

(301) 975-3955 kstricklett@nist.gov
(301) 975-8922 gfitzpatrick@nist.gov

Email:

kstricklett@nist.gov
gfitzpatrick@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather (301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
54210C	Resistor and Resistive Dividers, Total Resistance or Voltage Ratio, Two Direct Voltage Levels Between 10 kV and 150 kV	2427
54211S	Special Tests of Resistor and Resistive Dividers at Direct Voltage Levels, by Prearrangement	At Cost
54213S	Special Tests of Resistor and Resistive Dividers at 60 Hz, by Prearrangement	At Cost

Fees are subject to change without notice.

D.3 Capacitive Dividers

Technical Contacts:

Gerald J. FitzPatrick
(60 Hz/Pulsed Measurements)

Telephone:

(301) 975-8922 gfitzpatrick@nist.gov

Email:

gfitzpatrick@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather (301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
54310S	Special Test of Capacitive Dividers at 60-Hz, by Prearrangement	At Cost

D.4 Voltage and Current Transformers

Technical Contacts:

Gerald J. FitzPatrick
Thomas L. Nelson

Telephone:

(301) 975-8922
(301) 975-2986

Email:

gfitzpatrick@nist.gov
tnelson@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather

(301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
54510C	Voltage Transformer, Ratio & Phase Angle, at 60 Hz on 1 Range, 1 Secondary Voltage, 1 Burden Primary Vrms \leq 150 kV	At Cost
54520C	Current Transformer, Ratio & Phase Angle, 1 Range at 1 Frequency, 1 Burden, Secondary Currents (0.5, 1, 2, 3, 4, 5) A, Primary Current Not Over 12 000 A	3249
54521C	Current Transformer, Ratio & Phase Angle, 1 Secondary Current, Additional Combination of Range, Frequency, and Burden, Primary Current Not Over 12 000 A	301
54522C	Current Transformer, Ratio & Phase at Each Additional Secondary Current, Same Combination of Range, Frequency, and Burden as 54520C or 54521C	251
54600S	Special Tests of Dividers and Transformers, by Prearrangement	At Cost

Fees are subject to change without notice.

E. Phase Meters and Standards and VOR Measurements

Technical Contacts:

Mark E. Parker
Bryan C. Waltrip

Telephone:

(301) 975-2413
(301) 975-2438

Email:

mparker@nist.gov
bwaltrip@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather

(301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
55110S	Special Tests of Phase Standards and Related Instruments, by Prearrangement	At Cost
55120C	Phase Meters – One Combination of Input Voltages (0.5 V to 120 V) at One Frequency (2 Hz to 100 kHz) – the Input Voltage Ratio Shall Not Exceed 10	1211
55121C	Phase Meters – Each Additional Combination of Input Voltages (0.5 V to 120 V) at the Same or at a Different Frequency (2 Hz to 100 kHz) – the Input Voltage Ratio Shall Not Exceed 10	403
55130C	Phase Meters – One Additional Combination of One Input Voltage (0.5 V to 120 V) and One Input Current (1 A to 5 A) at One Frequency (2 Hz to 4 kHz)	1574
55131C	Phase Meters – Each Additional Combination of One Input Voltage (0.5 V to 120 V) and One Input Current (0.5 A to 5 A)	459

55140C	Phase Meters – One Input Voltage (120 V to 240 V) and Another Input Voltage (120 V to 240 V) at One Frequency (2 Hz to 5 kHz)	1574
55141C	Phase Meters – Each Additional Combination of One Input Voltage (120 V to 240 V) and Another Input Voltage (120 V to 240 V) at the Same or at a Different Frequency (2 Hz to 5 kHz)	459

Fees are subject to change without notice.

F. Power and Energy Measurements, Low-Frequency

Technical Contacts:

Thomas L. Nelson
Gerald J. FitzPatrick

Telephone:

(301) 975-2986
(301) 975-8922

Email:

tnelson@nist.gov
gfitzpatrick@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather (301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
56110S	Special Test of AC-DC Wattmeters, by Prearrangement	At Cost
56200C	Watt, Watthour, Var, Varhour Meter, Initial Two Determinations of Same Meter at 60 Hz	2922
56201C	Each Additional Determination, Same Meter at 50 Hz	186
56202C	Initial Two Determinations of One or Two Meters Run Simultaneously with the First (56200C)	2627
56210M	Measurement Assurance Program for Watthour Meters	3796
56220S	Special Tests of Watthour Meter with Pulse Output; 120 Volts, 5 Amperes, 60 Hz at 0.5 Lag, Unity and 0.5 Lead Power Factors	1207

Fees are subject to change without notice.

G. RF, Microwave and Millimeter-Wave Measurements

G.1 Thermistor Detectors

Technical Contacts:

Ronald A. Ginley
George M. Free
Thomas P. Crowley

Telephone:

(303) 497-3634
(303) 497-3609
(303) 497-4133

Email:

rginley@boulder.nist.gov
free@boulder.nist.gov
crowley@boulder.nist.gov

Mailing Address:

NIST
325 Broadway, MC 818.01
Boulder, CO 80305-3328

Administrative and Logistics:

Puanani L. DeLara

(303) 497-3753 calibration@boulder.nist.gov

Fax: (303) 497-3970

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
The following tests are for thermistor and thermoelectric detectors with coaxial connectors.		
61110S	Coaxial Detectors in the Frequency Range from 0.10 MHz to 10 MHz	2516
61111S	Additional Detector at the same Frequencies for Connector Type as First Device in 61110S	1659
61120S	Coaxial Detectors at User Selected Frequencies in the Appropriate Frequency Range for the Connector Type, Up to 20 Frequency Points.	2641
61121S	Additional Detector at the same Frequencies and Connector Type as First Device in 61120S	1719
61122S	Coaxial Detectors at User Selected Frequencies in the Appropriate Frequency Range for the Connector Type, 20 to 40 Frequency Points	2763
61123S	Additional Detector at the same Frequencies and Connector Type as First Device in 61122S	1861
61124S	Coaxial Detectors at User Selected Frequencies in the Appropriate Frequency Range for the Connector Type, 40 to 120 Frequency Points	3089
61125S	Additional Detector at the same Frequencies and Connector Type as First Device in 61124S	1993
61126S	Coaxial Detectors at User Selected Frequencies in the Appropriate Frequency Range for the Connector Type, Over 120 Frequency Points	3420
61127S	Additional Detector at the same Frequencies and Connector Type as First Device in 61126S	2176
61137C	NIST Model CN Coaxial Detectors at 21 Frequencies within the Frequency Range of 50 MHz to 18 GHz	2680
61138C	NIST Model CN Coaxial Detectors at Single Customer Selected Frequency within the Frequency Range of 50 MHz to 18 GHz	25
The following tests are for thermistor detectors with waveguide flanges.		
61144S	Rectangular Waveguide Detectors with WR90 Flanges at 200 MHz Intervals within the Frequency Range of 8.2 GHz to 12.4 GHz	3203
61145S	Additional Thermistor Detector at the same Frequencies as 61144S	1902

61146S	Rectangular Waveguide Detectors with WR62 Flanges at 250 MHz Intervals within the Frequency Range of 12.4 GHz to 18.0 GHz	3208
61147S	Additional Thermistor Detector at the same Frequencies as 61146S	1868
61148S	Rectangular Waveguide Detectors with WR42 Flanges at 1 GHz Intervals within the Frequency Range of 18 GHz to 26.5 GHz	3387
61149S	Additional Thermistor Detector at the same Frequencies as 61148S	1659
61150S	Rectangular Waveguide Detectors with WR28 Flanges at 1 GHz Intervals within the Frequency Range of 26.5 GHz to 40 GHz	3378
61151S	Additional Thermistor Detector at the same Frequencies as 61150S	1793
61152S	Rectangular Waveguide Detectors with WR22 Flanges at 1 GHz Intervals within the Frequency Range of 33 GHz to 50 GHz	3668
61153S	Additional Thermistor Detector at the same Frequencies as 61152S	1793
61154S	Rectangular Waveguide Detectors with WR15 flanges at 1 GHz Intervals within the Frequency Range of 50 GHz to 75 GHz, by Prearrangement Only	5449
61155S	Rectangular Waveguide Detectors with WR10 Flanges at a Single Frequency within the Frequency Range of 92 GHz to 98 GHz	5733
High Power Wattmeters		
61160S	High Power Wattmeters at up to 60 Points (# of Frequencies times # of Power Levels.) Choose Frequencies from 1 MHz to 1000 MHz and Power Levels from 1 W to 1000 W.	At Cost
61161S	Up to 90 Additional Test Points	At Cost
61162S	Up to 240 Additional Test Points	At Cost
61163S	Up to 540 Additional Test Points	At Cost
61164S	Up to 1440 Additional Test Points	At Cost
61190S	Special Microwave and RF Power Measurement Services, by Prearrangement	At Cost

Fees are subject to change without notice.

G.2 Scattering Parameters of Passive Multi-Port Devices

Technical Contacts:

Ronald A. Ginley

Telephone:

(303) 497-3634

Email:

rginley@boulder.nist.gov

Mailing Address:

NIST
325 Broadway, MC 818.01
Boulder, CO 80305-3328

Administrative and Logistics:

Puanani L. DeLara

(303) 497-3753 calibration@boulder.nist.gov

Fax: (303) 497-3970

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
The following tests are for two-port devices with coaxial connectors		
61210S	Coaxial Fixed and Variable Attenuators with GR900 Connectors (10 MHz to 8.5 GHz)	3387

61211S	Additional Two-Port Device at the same Frequencies as 61210S	1659
61212C	Coaxial Fixed and Variable Attenuators with GPC-7 Connectors (10 MHz to 18 GHz)	3437
61213S	Additional Two-Port Device at the same Frequencies as 61212C	2157
61214S	Coaxial Fixed and Variable Attenuators with Type N Connectors (10 MHz to 18 GHz)	3436
61215S	Additional Two-Port Device at the same Frequencies as 61214S	2143
61216S	Coaxial Fixed and Variable Attenuators with 3.5 mm Connectors (10 MHz to 33 GHz)	3380
61217S	Additional Two-Port Device at the same Frequencies as 61216S	1646
61218S	Coaxial Fixed and Variable Attenuators with 2.92 mm Connectors (50 MHz to 40 GHz)	3380
61219S	Additional Two-Port Device at the same Frequencies as 61218S	1656
61220S	Coaxial Fixed and Variable Attenuators with 2.4 mm Connectors (50 MHz to 50 GHz)	3383
61221S	Additional Two-Port Device at the same Frequencies as 61220S	1649
The following tests are for two-port devices with waveguide connectors.		
61230S	WR90 Rectangular Waveguide Fixed and Variable Attenuators (8.2 GHz to 12.4 GHz)	3213
61231S	Additional Two-Port Device at the same Frequencies as 61230S	1738
61232S	WR62 Rectangular Waveguide Fixed and Variable Attenuators (12.4 GHz to 18 GHz)	3213
61233S	Additional Two-Port Device at the same Frequencies as 61232S	1738
61234S	WR42 Rectangular Waveguide Fixed and Variable Attenuators (18 GHz to 26.5 GHz)	3387
61235S	Additional Two-Port Device at the same Frequencies as 61234S	1785
61236S	WR28 Rectangular Waveguide Fixed and Variable Attenuators (26.5 GHz to 40 GHz)	3419
61237S	Additional Two-Port Device at the same Frequencies as 61236S	1785
61238S	WR22 Rectangular Waveguide Fixed and Variable Attenuators (33 GHz to 50 GHz)	3387
61239S	Additional Two-Port Device at the same Frequencies as 61238S	1785
61240S	WR15 Rectangular Waveguide Fixed and Variable Attenuators (50 GHz to 75 GHz)	5851
61241S	Additional Frequencies for same device done on test 61240S	2978
61242S	WR10 Rectangular Waveguide Fixed and Variable Attenuators (92 GHz to 98 GHz)	5851
61243S	Additional Frequencies for same device done on test 61242S	2978

61249S	Special Attenuation Measurements, by Prearrangement	At Cost
61250S	Time Delay, Coaxial and Waveguide, by Prearrangement	At Cost
The following tests are for one-port devices with coaxial connectors.		
61260S	Coaxial One-Port Devices with GR900 Connectors (10 MHz to 8.5 GHz)	3293
61261S	Additional One-Port Device at the same Frequencies as 61260S	1619
61262C	Coaxial One-Port Devices with GPC-7 Connectors (10 MHz to 18 GHz)	3293
61263S	Additional One-Port Devices at the same Frequencies as 61262C	1911
61264S	Coaxial One-Port Devices with Type N Connectors (10 MHz to 18 GHz)	3282
61265S	Additional One-Port Device at the same Frequencies as 61264S	1887
61266S	Coaxial One-Port Devices with 3.5 mm Connectors (10 MHz to 33 GHz)	3380
61267S	Additional One-Port Device at the same Frequencies as 61266S	1459
61268S	Coaxial One-Port Devices with 2.92 mm Connectors (50 MHz to 40 GHz)	3380
61269S	Additional One-Port Device at the same Frequencies as 61268S	1459
61270S	Coaxial One-Port Devices with 2.4 mm Connectors (50 MHz to 50 GHz)	3380
61271S	Additional One-Port Device at the same Frequencies as 61270S	1455
The following tests are for one-port devices with waveguide connectors.		
61280S	WR90 Rectangular Waveguide (8.2 GHz to 12.4 GHz)	3203
61281S	Additional One-Port Device at the same Frequencies as 61280S	1591
61282S	WR62 Rectangular Waveguide (12.4 GHz to 18 GHz)	3208
61283S	Additional One-Port Device at the same Frequencies as 61282S	1597
61284S	WR42 Rectangular Waveguide (18 GHz to 26.5 GHz)	3387
61285S	Additional One-Port Device at the same Frequencies as 61284S	1643
61286S	WR28 Rectangular Waveguide (26.5 GHz to 40 GHz)	3387
61287S	Additional One-Port Device at the same Frequencies as 61286S	1643
61288S	WR22 Rectangular Waveguide (33 GHz to 50 GHz)	3387
61289S	Additional One-Port Device at the same Frequencies as 61288S	1643
61290S	WR15 Rectangular Waveguide (50 GHz to 75 GHz)	5851
61291S	Additional Frequencies for same Device done on 61290S	2941
61292S	WR10 Rectangular Waveguide (92 GHz to 98 GHz)	5851
61293S	Additional Frequencies for same Device done on 61292S	2941
61294S	Special Reflection Coefficient Measurements, by Prearrangement	At Cost
61295S	Coaxial Fixed and Variable Phase Shifters; Frequency Range 1 GHz to 50 GHz, Phase Range 0° to 360°	At Cost

61296S	Waveguide Fixed and Variable Phase Shifters; Specify Frequencies for Waveguide Sizes WR10, WR15, WR22, WR28, WR42, WR62, and WR90	At Cost
61297S	Special Tests of Phase Shifters, by Prearrangement	At Cost

Fees are subject to change without notice.

G.3 High-Accuracy Attenuation Measurements

Technical Contacts:

Ronald A. Ginley
Jeff Jargon

Telephone:

(303) 497-3634
(303) 497-3516

Email:

rginley@boulder.nist.gov
jargon@boulder.nist.gov

Mailing Address:

NIST
325 Broadway, MC 818.01
Boulder, CO 80305-3328

Administrative and Logistics:

Puanani L. DeLara

(303) 497-3753 calibration@boulder.nist.gov

Fax: (303) 497-3970

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
61300S	High-Accuracy Attenuation: Set Up Charge, per order	At Cost
61330S	Attenuation Measurements of Three-Port and Two-Port Devices at 1.25 MHz, 0 dB and 6 dB	At Cost
61350C	Coaxial Fixed and Variable Phase Shifters; Characteristics Phase Shift Difference; Precision Connectors; Measured at 30 MHz, Range 0° to 360°	At Cost

G.4 Thermal Noise Measurements

Technical Contacts:

David Walker
James Randa

Telephone:

(303) 497-5490
(303) 497-3150

Email:

dwalker@boulder.nist.gov
randa@boulder.nist.gov

Mailing Address:

NIST
325 Broadway, MC 818.01
Boulder, CO 80305-3328

Administrative and Logistics:

Puanani L. DeLara

(303) 497-3753 calibration@boulder.nist.gov

Fax: (303) 497-3970

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Freq.	Connector Type	Device Requirements/Service	Fee (\$)
61410S	30 MHz 60 MHz	Coaxial N Precision (PIN) GPC 3.5 (PIN) GPC 7 14 mm	Temperature < 15 000 K (ENR < 17 dB) VSWR < 1.2	
			Set Up Charge, per order	1881
			Per Frequency	3069

61420S	1.0 GHz to 12.4 GHz Continuous Frequencies	<i>Coaxial</i> 14 mm (1 to 4 GHz) GPC 7 N Precision (PIN) GPC 3.5 (PIN) GPC 2.4 (PIN) (8 to 12.4 GHz)	Temperature < 15 000 K (ENR < 17 dB) Reflection Coefficient < 0.2	
				Set Up Charge, per order
				2549
61425S	12.4 GHz to 18.0 GHz Continuous Frequencies	<i>Coaxial</i> GPC 7 N Precision (PIN) GPC 3.5 (PIN) GPC 2.4 (PIN)	Temperature < 15 000 K (ENR < 17 dB) Reflection Coefficient < 0.2	
				Set Up Charge, per order
				3469
61430S	18.0 GHz to 26 GHz Continuous Frequencies	<i>Coaxial</i> GPC 3.5 (PIN) GPC 2.4 (PIN)	Temperature < 15 000 K (ENR < 17 dB) Reflection Coefficient < 0.2	
				Set Up Charge, per order
				3447
61435S	26.5 GHz to 40 GHz Continuous Frequencies	<i>Coaxial</i> GPC 2.4 (PIN)	Temperature < 15 000 K (ENR < 17 dB) Reflection Coefficient < 0.2	
				Set Up Charge, per order
				4911
61450S	8.2 GHz to 12.4 GHz Continuous Frequencies	<i>Waveguide</i> WR 90	Temperature < 15 000 K (ENR < 17 dB) Reflection Coefficient < 0.2	
				Set Up Charge, per order
				2761
61455S	12.4 GHz to 18.0 GHz Continuous Frequencies	<i>Waveguide</i> WR 62	Temperature < 15 000 K (ENR < 17 dB) Reflection Coefficient < 0.2	
				Set Up Charge, per order
				3447
61460S	18.0 GHz to 26.0 GHz Continuous Frequencies	<i>Waveguide</i> WR 42	Temperature < 15 000 K (ENR < 17 dB) Reflection Coefficient < 0.2	
				Set Up Charge, per order
				3447
				Per Frequency
				287
				Per Frequency
				1963
				Per Frequency
				1963
				Per Frequency
				2819
				Per Frequency
				287
				Per Frequency
				1856
				Per Frequency
				1856

61465S	26.5 GHz to 40.0 GHz Continuous Frequencies	Waveguide WR 28	Temperature < 15 000 K (ENR < 17 dB) Reflection Coefficient < 0.2	
	Set Up Charge, per order			4559
	Per Frequency			2130
61470S	33 GHz to 50 GHz Continuous Frequencies	Waveguide WR 22	Temperature <15 000 K (ENR < 17 dB) Reflection Coefficient <0.2	
	Set Up Charge, per order			4880
	Per Frequency			2631
61475S	50 GHz to 65 GHz Continuous Frequencies	Waveguide WR 15	Temperature < 15 000 K (ENR , 17 dB) Reflection Coefficient < 0.2	
	Set Up Charge, per order			4895
	Per Frequency			3363
61495S	Special Noise Temperature Measurements, by Prearrangement			At Cost

Fees are subject to change without notice.

G.5 Microwave Dielectric and Magnetic Material Measurements

Technical Contact:

James R. Baker-Jarvis

Telephone:

(303) 497-5621

Email:

jjarvis@boulder.nist.gov

Mailing Address:

NIST
325 Broadway, MC 818.01
Boulder, CO 80305-3328

Administrative and Logistics:

Puanani L. DeLara

(303) 497-3753 calibration@boulder.nist.gov

Fax: (303) 497-3970

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
61620S	Special Tests for Dielectric and Magnetic Materials 1 kHz to 60 GHz	At Cost
61640S	Special Consulting and Advisory Services for Dielectric and Magnetic Materials, by Prearrangement	At Cost

H.1 Microwave Antenna Parameter Measurements

Mailing Address:

Perry F. Wilson (63100S-63400S)	(303) 497-3406	pfw@boulder.nist.gov	NIST 325 Broadway, MC 818.02 Boulder, CO 80305-3328
Katherine MacReynolds (63100S)	(303) 497-3471	mreynold@boulder.nist.gov	
Michael H. Francis (63200S)	(303) 497-5873	francis@boulder.nist.gov	

Puanani L. Delara (303) 497-3753 calibration@boulder.nist.gov
Fax: (303) 497-3970

Service ID Number	Description of Services	Fee (\$)
63100S	Gain and Polarization Calibrations of Standard Antennas Using Extrapolation Range	At Cost
63200S	Measurement of Pattern, Gain, and Polarization of Arbitrary Antennas Using Near-Field Scanning Techniques	At Cost
63300S	Special Test Service for Calibration of Probes Used with Near-Field Scanning Facilities	At Cost
63400S	Special Consulting, Advisory, and Other Services	At Cost

Mailing Address:

Dennis G. Camell	(303) 497-3214	camell@boulder.nist.gov	NIST
Perry F. Wilson	(303) 497-3406	pfw@boulder.nist.gov	325 Broadway, MC 818.02 Boulder, CO 80305-3328

Puanani L. DeLara (303) 497-3753 calibration@boulder.nist.gov
Fax: (303) 497-3970

Service ID Number	Description of Services	Fee (\$)
64100S	Special Test Services for Antenna/Field Strength/M Measurement, Using the Transverse Electromagnetic (TEM) Cell Method (10 kHz to 300 MHz)	At Cost
64200S	Special Test Services for Antenna/Field Strength/Measurements, Utilizing the Open Area Test Site and Standard Antenna Method	At Cost
64300S	Special Test Services for Antenna/Field Strength/Reflectivity Measurements, Utilizing the Anechoic Chamber and Standard Field Method	At Cost

I. Pulse Waveform Measurements

Technical Contacts:

Donald R. Larson
David I. Bergman

Telephone:

(301) 975-2437
(301) 975-4464

Email:

larson@nist.gov
dbergman@nist.gov

Mailing Address:

NIST
100 Bureau Drive, Stop 8170
Gaithersburg, MD 20899-8170

Administrative and Logistics:

Denise D. Prather

(301) 975-4221 dprather@nist.gov

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
65100S	Impulse Spectrum Amplitude (50 Ω)	At Cost
65200S	Fast Repetitive Pulse Transition Parameters (50 Ω)	At Cost
65250S	Fast Repetitive Pulse Settling Parameters (50 Ω)	At Cost
65300S	Network Impulse Response (Transfer Function) of Coaxial Networks	At Cost
65400S	Pulse Time Delay Interval	At Cost

CHAPTER 10

TIME AND FREQUENCY MEASUREMENTS

A. Broadcast and Measurement Services

<u>Technical Contacts:</u>	<u>Telephone:</u>	<u>Email:</u>	<u>Mailing Address:</u>
Michael A. Lombardi (Frequency)	(303) 497-3212	lombardi@boulder.nist.gov	NIST
Marc A. Weiss (Time)	(303) 497-3261	mweiss@boulder.nist.gov	325 Broadway, MC 847.40
John Lowe	(303) 497-5453	lowe@boulder.nist.gov	Boulder, CO 80305-3328

Administrative and Logistics:

Trudi Peppler (303) 497-3338 tpeppler@boulder.nist.gov
Fax: (303) 497-6461

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
	Broadcast Services (WWW, WWVH, WWVB, GOES, ACTS and NTS)	
76100S	Frequency Measurement Service (Frequency Delivered to User's Site)	Initial One-Time Fee \$1,500 Monthly Charge \$500
76110S	Global Time Service (Frequency and Time delivered to User's Site)	\$15,000 per year
76120S	Characterization of Global Positioning System (GPS) Satellite Receivers	At Cost

B. Calibration and Characterization of Oscillators and Amplifiers

<u>Technical Contacts:</u>	<u>Telephone:</u>	<u>Email:</u>	<u>Mailing Address:</u>
David Howe	(303) 497-3277	dhowe@boulder.nist.gov	NIST
James E. Gray	(303) 497-3209	jgray@boulder.nist.gov	325 Broadway, MC 847
			Boulder, CO 80305-3328

Administrative and Logistics:

Trudi Peppler (303) 497-3338 tpeppler@boulder.nist.gov
Fax: (303) 497-6461

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
77100C	Oscillator Frequency Calibration	At Cost
77110C	Characterization of Atomic Frequency Standards	At Cost
77120C	Characterization of Oscillators: Time Domain	At Cost

77130C	Characterization of Oscillators and Amplifiers: Phase Noise in the Frequency Domain	At Cost
77131C	Characterization of Oscillators and Amplifiers: Amplitude Noise in the Frequency Domain	At Cost

C. Test of PM/AM Noise Measurement Systems

Technical Contact:

David Howe

Telephone:

(303) 497-3277

Email:

dhowe@boulder.nist.gov

Mailing Address:

NIST
325 Broadway, MC 847.30
Boulder, CO 80305-3328

Administrative and Logistics:

Trudi Peppler

(303) 497-3338

tpeppler@boulder.nist.gov

Fax: (303) 497-6461

Do not ship instruments or standards to the mailing address. Contact the staff for the shipping address.

Service ID Number	Description of Services	Fee (\$)
77135C	Tests of RF PM/AM Noise Measurement Systems: On-Site Tests	At Cost
77136C	Tests of Microwave PM/AM Noise Measurement Systems: On-Site Tests	At Cost
77140S	Special Time/Frequency Measurements: Oscillators and Other Components	At Cost

CHAPTER 11

SEMINARS

The following announcements concern notification of changes in services and information about future NIST Measurement Seminars. General policy question regarding NIST measurement services should be referred to the Calibration Program.

NIST MEASUREMENT SEMINARS

NIST holds seminars and workshops that provide advice and assistance on measurements and calibrations. This affords laboratories outside NIST and opportunity to learn how to make measurements consistent with national standards which NIST maintains. Participation is open to a limited number of people who have the appropriate education, work experience, and current profession in measurement and standards laboratory activities.

Each seminar lasts from one to five days and is devoted to lectures, group discussions, and laboratory demonstrations. A course may be cancelled if registration is insufficient. However, in the past, requests for enrollment have nearly always exceeded the numbers that could be accommodated.

Acceptance letters will be mailed no later than 4 weeks prior to the scheduled date of the course. Detailed information on schedules and housing will be included. Those accepted will be expected to study the assigned reading material before coming to the course and should be prepared to discuss their own experiences with related problems.

See the Weights and Measures Program web site www.ts.nist.gov/ts/htdocs/230/235/calen103.htm for the NCWM Calendar of Events for other training not listed here.

NIST offers conferences and workshops throughout the year. To see the latest listing go to www.nist.gov/public_affairs/confpage/confutr.htm for Upcoming NIST Conferences.

ALPHABETICAL CROSS-INDEX

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Ac-dc watt-hour or var-hour meters	56110S-56210M
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Acoustic devices	25060S
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